

Planning Aid Report



Multi-species Conservation under the Comprehensive Everglades Restoration Plan (CERP)

- Part 1 - Initial CERP Update (ICU) Footprint Analysis



**Prepared by:
U. S. Fish and Wildlife Service
South Florida Ecological Services Office
Vero Beach, Florida**

and

**Florida Fish and Wildlife Conservation
Commission
Vero Beach, Florida**

February 27, 2004

Executive Summary

The U.S. Fish and Wildlife Service (Service) and the Florida Fish and Wildlife Conservation Commission (FWC) have prepared this Planning Aid Report (PAR) as part of our contribution to the U.S. Army Corps of Engineers' (Corps) Initial Comprehensive Everglades Restoration Plan (CERP) Update (ICU). This PAR is provided as a program-level planning tool for maximizing benefits and minimizing impacts to South Florida federally listed threatened and endangered species and designated critical habitats, and state-listed species, and the ecosystems on which they depend during siting and construction of CERP features. The body of the report focuses on a project-by-project programmatic-level analysis of possible impacts and benefits to listed species resulting from the construction or "footprint" of CERP projects along with recommendations for maximizing these benefits and minimizing these impacts. We have included a section on South Florida listed species (Appendix A) and South Florida vertebrate and vascular plant species (Appendix B). We have also included guidance on affirmative actions to conserve and further recovery of listed species and natural ecological communities affected by the CERP (Appendix C), a section focusing on West-Indian manatees conservation (Appendix D), a section focusing on recommendations for design and operation of Stormwater Treatment Areas and reservoirs (Appendix E) that could be considered by Project Delivery Teams (PDTs).

The potential impacts and benefits presented here are uncertain. We expect the actual impacts of most CERP projects to be both different and smaller than presented here. It is the intent and purpose of this report to provide the information that PDTs will need to move from this worst case scenario toward maximizing restoration benefits.

This analysis is intended for planning purposes only as a tool to assist in the siting and construction of CERP infrastructure, and does not anticipate take of listed species as defined by the Endangered Species Act. In most cases our analysis is based on the limited information that is available for projects that are in the early stages of planning and is designed to project a reasonable worst case scenario based on that limited information.

Additionally, this report does not include the hydrologic effects of CERP projects in the remaining Everglades. We expect that significant benefits to wetland-dependent listed species and wetland ecosystems will be realized through these hydrologic effects that will be analyzed in a later report.

The individual project analyses were developed based on the best available scientific information for each of the listed species and the most detailed information available on each of the CERP projects. Each action was identified and siting information was described. In many cases, siting of project features had not been finalized and available information on siting ranged from somewhat to very uncertain. In these cases, the project biologists worked with Corps and South Florida Water Management District (District) project managers, PDTs, and other knowledgeable individuals to make reasonable assumptions about likely siting. When specific information was not available, at least one siting option explored represented a reasonable worst case scenario for listed species impacts.

The next step was the identification of species and habitats, and designated critical habitats likely to be exposed to the activities identified. Sixteen individual federally listed species (two mammal, eight bird, two reptile, one invertebrate, and three plant species), four groups of federally listed species (consisting of two skinks, five sea turtles, two pine rockland plants, and 20 high pine-scrub plants representing 29 additional individual species), and federally designated critical habitat for four species (listed resources) were identified that may be affected by the CERP projects. In order to provide a conservative analysis, we assumed that all suitable habitat was occupied. The final step in each analysis was identification of the likely response of species and habitats to each of the project activities. Effects such as construction disturbance, increased or decreased risk of vehicle collisions or improved habitat connectivity could not be expressed in acres and so are not included in this summary. Readers interested in all potential effects of a project should read the full project analysis.

At this time, the 54 CERP project footprints analyzed in this report comprise between 1.9 and 2.0 million acres of the approximately 13 million acres within the CERP planning area. We identified six species or species groups (bald eagle, Everglade snail kite, sea turtles, Schaus swallowtail butterfly, high pine scrub plants and the Okeechobee gourd) for which the beneficial footprint effects of CERP are likely to be larger than the negative footprint effects. As CERP projects and analyses are further refined we expect reduced negative footprint effects estimates for the bald eagle and Okeechobee gourd. We identified eight species (Audubon's crested caracara, Florida grasshopper sparrow, Florida scrub-jay, Red-cockaded woodpecker, wood stork, American crocodile, Eastern indigo snake and beautiful pawpaw) for which the likely negative footprint effects of CERP are larger than the likely beneficial footprint impacts. Of these eight, the conservative nature of our analysis and the high uncertainty of siting information for some projects likely led to a substantial overestimation of adverse effects for the Audubon's crested caracara, Florida scrub-jay and the Red-cockaded woodpecker. We expect that more refined PDT analyses and project siting information combined with analysis of the likely beneficial effects of CERP hydrologic changes would lead to an overall positive impact of CERP on the wood stork and American crocodile and the avoidance of all adverse effects on the beautiful pawpaw. Future analyses for the remaining two species, the Florida grasshopper sparrow and the Eastern indigo snake, will likely continue to show net negative effects.

As expected, a large wetlands restoration project such as the CERP is likely to have some substantial negative effects on species that require upland habitats as all or a portion of their range. The large storage area projects contribute most to these negative effects since they are to be built on large areas of mostly upland habitat. PDTs for these projects have opportunities to substantially reduce these impacts by siting storage reservoirs and Stormwater Treatment Areas in areas of minimal value to listed species, by reducing the footprint size of their projects and through exploration of alternative storage components such as natural storage areas. Perhaps the most important opportunity of this kind would be avoiding placement of the Caloosahatchee Basin projects on property that includes a large area of potential Florida grasshopper sparrow habitat and an important Audubon's crested caracara juvenile congregation area. In addition, land acquisition, water storage siting, and final alternative selection for several key CERP

projects including the Southern Golden Gates Hydrologic Restoration, Indian River Lagoon - South, and Caloosahatchee basin and Lake Okeechobee watershed projects could improve our initial analysis of potential effects to panther habitat values within the Everglades ecosystem.

Our analysis underscores the crucial role of the natural storage areas that are part of the Indian River Lagoon - South Project. These features provide all or the large majority of estimated benefits for seven species and, in several cases, create a positive overall balance of CERP effects for these species. If these features were to be removed from the CERP, a very large amount of compensation would be needed in order to balance likely CERP adverse effects. Incorporation of further natural storage area components into other CERP projects such as the Lake Okeechobee Watershed Project and Caloosahatchee Basin Projects would provide further multi-species benefits.

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List of Acronyms

ASR	Aquifer Storage and Recovery
BCNP	Big Cypress National Preserve
C-100 (<i>e.g.</i>)	Canal number
C&SF Restudy	Central and Southern Florida Project Comprehensive Review Study
CERP	Comprehensive Everglades Restoration Plan
CFA	Core Foraging Area for wood storks
CFR	Code of Federal Regulations
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
Decomp	Decomartmentalization
DEP	Florida Department of Environmental Protection
District	South Florida Water Management District
EAA	Everglades Agricultural Area
ENP	Everglades National Park
ESA	Endangered Species Act
FLUCCS	Florida Land Use, Cover and Forms Classification System
FWC	Florida Fish and Wildlife Conservation Commission
FWCA	Fish and Wildlife Coordination Act
GIS	Geographic Information System
L-100 (<i>e.g.</i>)	Levee number
LOWP	Lake Okeechobee Watershed Project
Loxahatchee NWR	Arthur R. Marshall Loxahatchee National Wildlife Refuge
LWDD	Lake Worth Drainage District
mgd	million gallons per day
MSRP	Multi-species Recovery Plan
NGVD	National Geodetic Vertical Datum
NOAA-Fisheries	National Oceanic and Atmospheric Administration - Fisheries
PAL	Planning Aid Letter (under the Fish and Wildlife Coordination Act)
PAR	Planning Aid Report (under the Fish and Wildlife Coordination Act)
PBCARR	Palm Beach County Agricultural Reserve Reservoir
PDT	Project Delivery Team
PIR	Project Implementation Report
PMP	Project Management Plan
PSP	Pre Selected Plan \ regional water model simulations
PSPS 1234	Pre Selected Plan Scenario / (for Water Preserve Areas)
RECOVER	Restoration Coordination and Verification
S-100 (<i>e.g.</i>)	Structure number
Service	U.S. Fish and Wildlife Service
SGGE	Southern Golden Gate Estates
SHCA(s)	Strategic Habitat Conservation Area(s)
STA(s)	Stormwater Treatment Area(s)
USGS	U.S. Geological Survey
WCA(s)	Water Conservation Area(s)
WPA(s)	Water Preserve Area(s)

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- Appendix B. South Florida vertebrate and vascular plants species and scientific names by taxonomic group. This appendix includes amphibians and reptiles, birds, mammals, and freshwater fish, and crustaceans referred to in this document.
- Appendix C. Conservation of Multi-species Recovery Plan (MSRP) ecological communities and listed species.
- Appendix D. CERP Interagency Manatee Task Force narrative and draft protocols to minimize/avoid entrapment, for existing and new culverts located in manatee accessible projects, thermal protocols, blasting protocols, aerial observer protocols, ground observer protocols and observer qualifications.
- Appendix E. Fish and Wildlife Recommendations for Stormwater Treatment Area and Reservoir Operation and Design

Introduction

The U.S. Fish and Wildlife Service (Service) and the Florida Fish and Wildlife Conservation Commission (FWC) have prepared this Planning Aid Report (PAR) as part of our contribution to the U.S. Army Corps of Engineers' (Corps) Initial Comprehensive Everglades Restoration Plan (CERP) Update (ICU) in accordance with the Fish and Wildlife Coordination Act of 1958 (48 Stat. 401, as amended: 16 U.S.C. 661 *et seq.*) (FWCA) and the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA). The purpose of the ICU is to update the 1999 Central and Southern Florida (C&SF) Project Comprehensive Review Study plan represented by model run D13R (Restudy Plan), and documented in the U.S. Army Corps of Engineers' (Corps) *Final Integrated Feasibility Report and Programmatic Environmental Impact Statement, Central and Southern Florida Project Comprehensive Review Study* (Corps 1999). Because the ICU is a technical update of the Restudy Plan and not a decision-making process contemplating changes to the Restudy Plan, we will provide planning assistance updating our March 1, 1999 FWCA Report on the Restudy Plan through this and subsequent PARs rather than through a new FWCA Report.

This PAR is provided as a program-level planning tool for maximizing benefits and minimizing impacts to South Florida federally listed threatened and endangered species and designated critical habitats, and state listed species, and the ecosystems on which they depend during siting and construction of CERP features. The body of the report focuses on a project-by-project programmatic-level analysis of possible impacts and benefits to listed species resulting from the construction or "footprint" of CERP along with recommendations for maximizing these benefits and minimizing these impacts. The potential impacts and benefits presented here are uncertain. We expect the actual impacts of most CERP projects to be both different and smaller than presented here. It is the intent and purpose of this report to provide the information that Project Delivery Teams (PDTs) will need to move from this worst case scenario towards maximizing restoration benefits.

This analysis is intended for planning purposes only as a tool to assist in the siting and construction of CERP infrastructure, and does not anticipate take of listed species as defined by the ESA. In most cases our analysis is based on the limited information that is available for projects that are in the early stages of planning and is designed to project a reasonable worst case scenario based on that limited information.

Additionally, the hydrologic, downstream, effects of CERP components are addressed here only for those CERP components that are not included in South Florida Water Management Model modeling conducted as part of the ICU. We expect that significant benefits to wetland-dependent listed species and wetland ecosystems will be realized through these hydrologic effects. Our analysis of the hydrologic effects of those components modeled as part of ICU will be presented in a later PAR. A recommendations section provides guidance on minimizing impacts and maximizing benefits based on the results of the analysis and includes a section focusing on recommendations for design and operation of Stormwater Treatment Areas (STAs) and reservoirs. Service coordination with the Corps and District on each project is summarized

though September 2003. More recent coordination information is provided to the Corps in quarterly FWCA reporting.

As appendices to the report, we have provided lists of threatened and endangered species (Appendix A) and of vertebrate and vascular plants (Appendix B) that occur in the CERP project area. Scientific names for all species are included in these appendices and will not be repeated in the text. Appendix C provides a listing of recovery actions from the *South Florida Multi-species Recovery Plan* (MSRP) (Service 1999a) that the Corps may wish to implement as part of the CERP in furtherance of the affirmative duty of all Federal agencies under section 7(a)(1) of the ESA to use their authorities in furtherance of the protection and recovery of listed species. Appendix C updates our February 14, 1998, letter providing similar guidance during the Restudy process. Appendix D contains several draft protocols developed by the CERP Interagency Manatee Task Force under the auspices of the Florida Manatee Recovery Team providing information and guidance on the potential effects of CERP on the West Indian manatee. Appendix E contains a version of the *Fish and Wildlife Recommendations for Stormwater Treatment Area and Reservoir Operation and Design* developed by an intra-Service team and reviewed by biologists, scientists, and other experts involved in Everglades restoration tasks and teams. We anticipate that these products will continue to evolve as CERP planning proceeds and new information becomes available.

General Project Description

In general, the CERP seeks to restore the biological integrity of the remaining natural areas within the project boundaries through modifications to the existing C&SF Project while also providing for the water supply and flood control needs in this area. A detailed description of the means for accomplishing these goals was provided in the Final Integrated Feasibility Report and Programmatic Environmental Impact Statement, Central and Southern Florida Project Comprehensive Review Study (Corps 1999) which will be updated with new information in a Technical Documentation Report for the ICU, currently scheduled for final publication in June 2004. A general description of some of the major features (Fig. 1) of the proposed action is provided below as an introduction.

CERP Components

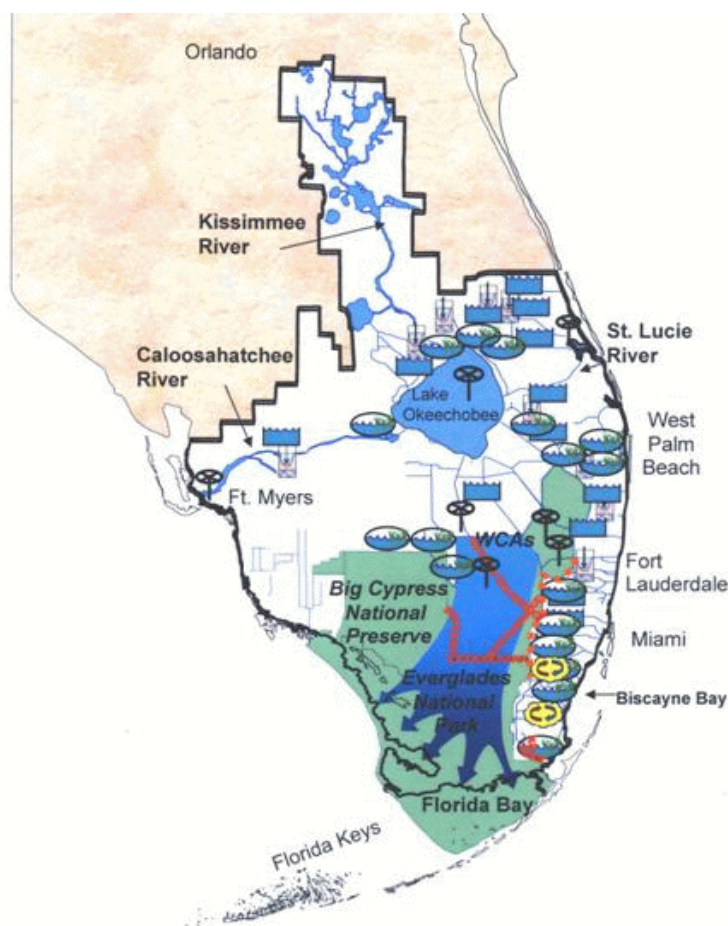


Figure 1. Major Comprehensive Everglades Restoration Plan components.

Groups of the major features included in the CERP include aquifer storage and recovery, water storage in surface and below ground reservoirs and stormwater treatment areas, wastewater reuse, seepage management, removing or modifying barriers to flow such as canals and levees, and operational changes. Please refer to the individual project sections for more detailed descriptions of features planned for each project.

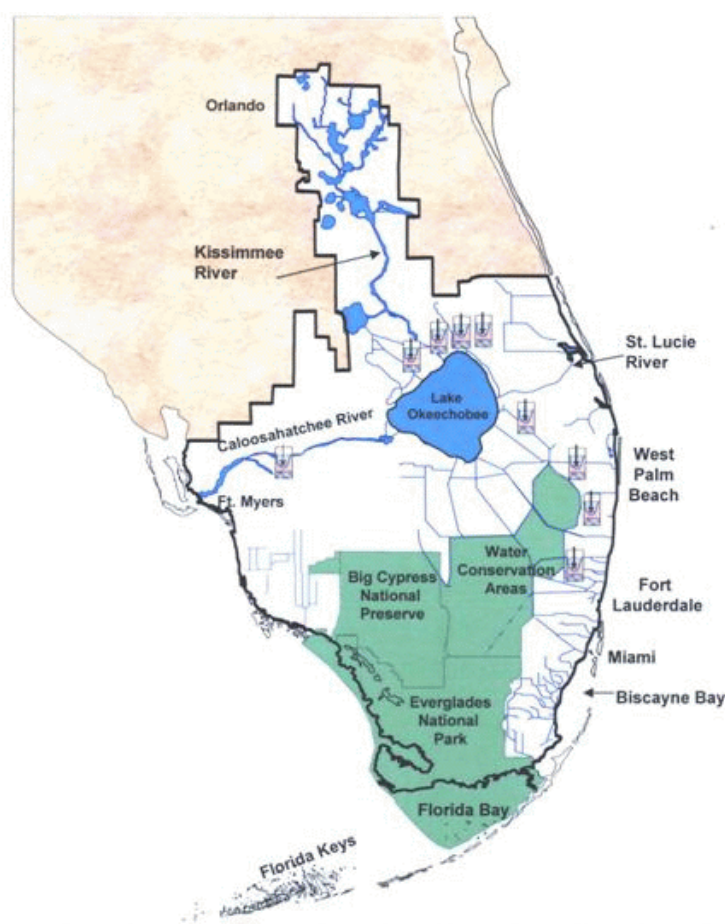


Figure 2. Comprehensive Everglades Restoration Plan Aquifer Storage and Recovery (ASR) components.

Aquifer Storage and Recovery Wells

Aquifer Storage and Recovery Wells (ASR) are planned for several areas (Fig. 2). ASR wells will store excess water when it is not needed in the natural system or for water supply, so that it may be used later. This is accomplished through injecting excess water into underground aquifers where it is stored and later recovered through pumping water back to surface discharge facilities. ASR facilities are planned along the northern rim of Lake Okeechobee, in the Caloosahatchee Basin and in western Palm Beach County.

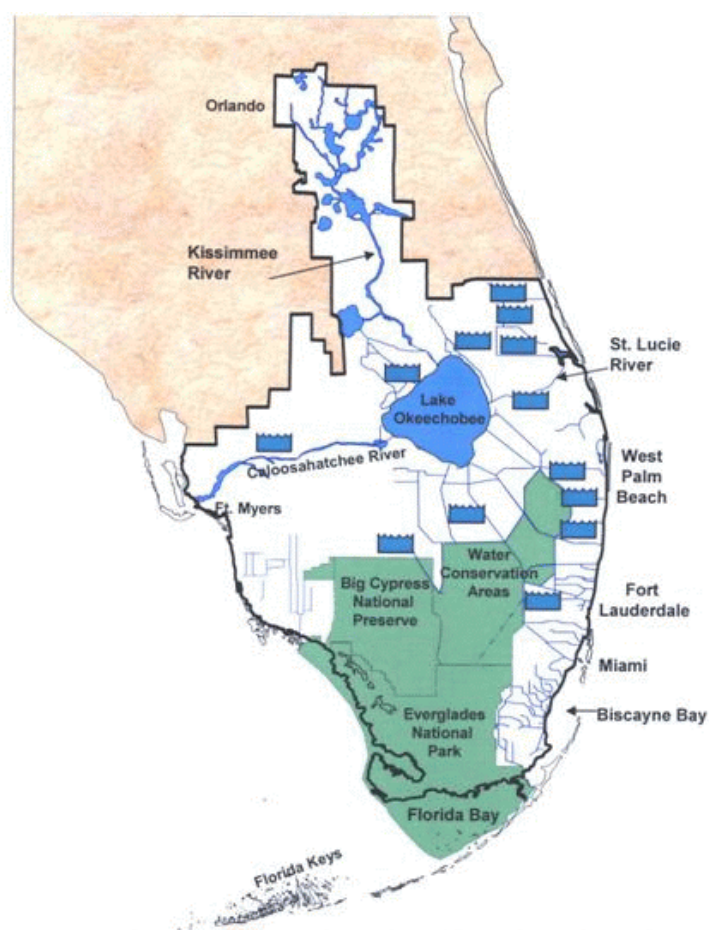


Figure 3. Comprehensive Everglades Restoration Plan surface water storage components.

Surface Water Storage

New water storage reservoirs are proposed in the following general areas: 20,000 acres in the Kissimmee River Basin near Lake Okeechobee; 10,000 acres in the St. Lucie River Basin near Lake Okeechobee; 20,000 acres in the Caloosahatchee River Basin near Lake Okeechobee and 60,000 acres in the Everglades Agricultural Area (Fig. 3). Acreages given here are approximate figures based on the Final Integrated Feasibility Report and Programmatic Environmental Impact Statement, Central and Southern Florida Project Comprehensive Review Study (Corps 1999). These reservoirs will store excess water when it is not needed in the natural system or for water supply, so that it may be used later, replacing some of the storage once provided by natural wetlands that have been lost to development. Currently, much of this excess water is discharged to the Atlantic Ocean and Gulf of Mexico where it often causes adverse impacts to estuarine environments.

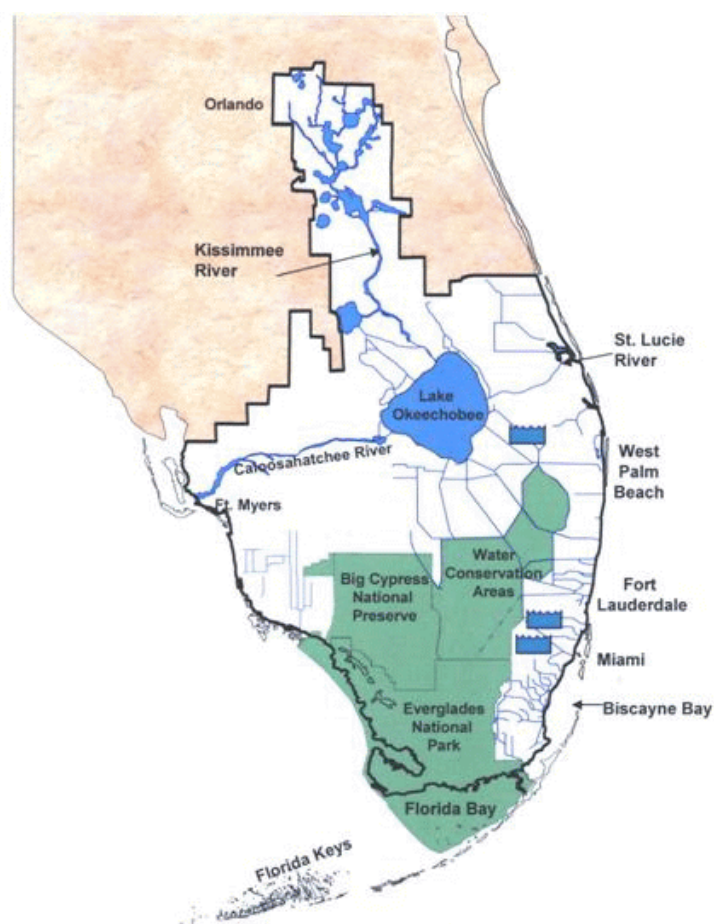


Figure 4. Comprehensive Everglades Restoration Plan subsurface water storage components.

In-Ground Water Storage

Additional water storage will be accomplished through subsurface water storage areas (Fig. 4). These facilities will consist of areas excavated to many feet below grade and lined with seepage control materials. In some cases, above ground levees will also be constructed, allowing storage of water both above and below grade. These space-efficient features will allow storage of very large volumes of water within a comparatively small footprint. These facilities are planned for western Palm Beach, Broward and Miami-Dade Counties.

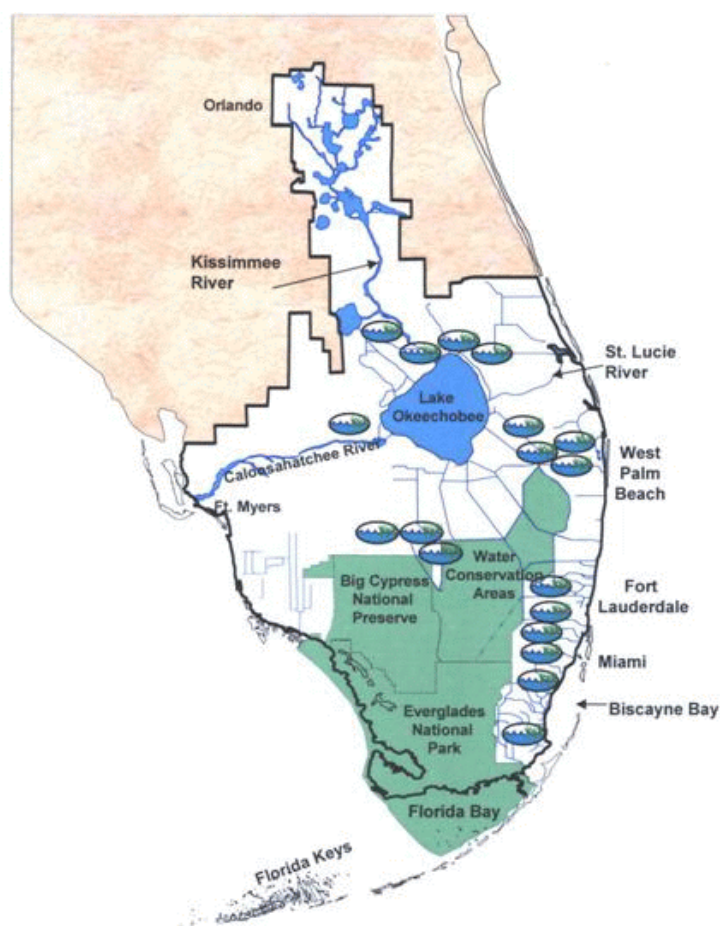


Figure 5. Comprehensive Everglades Restoration Plan Stormwater Treatment Area (STA) components.

Stormwater Treatment Areas

Constructed wetlands, called Stormwater Treatment Areas STAs (Fig. 5), will be used to improve water quality and, secondarily, improve water supply and flood control. The STAs will be designed to attenuate water flow and to mimic some features of natural Everglades wetlands, thereby improving water quality through both settling action and uptake of nutrients and other pollutants by the wetland vegetation. STAs also provide a limited water storage benefit that may help to improve flood control and attenuate undesirable high flow events in downstream natural areas. STA facilities are planned for north of Lake Okeechobee, in the Caloosahatchee and St. Lucie Basins, west of Water Conservation Area 3A (WCA-3A) and in western Broward and Miami-Dade Counties.

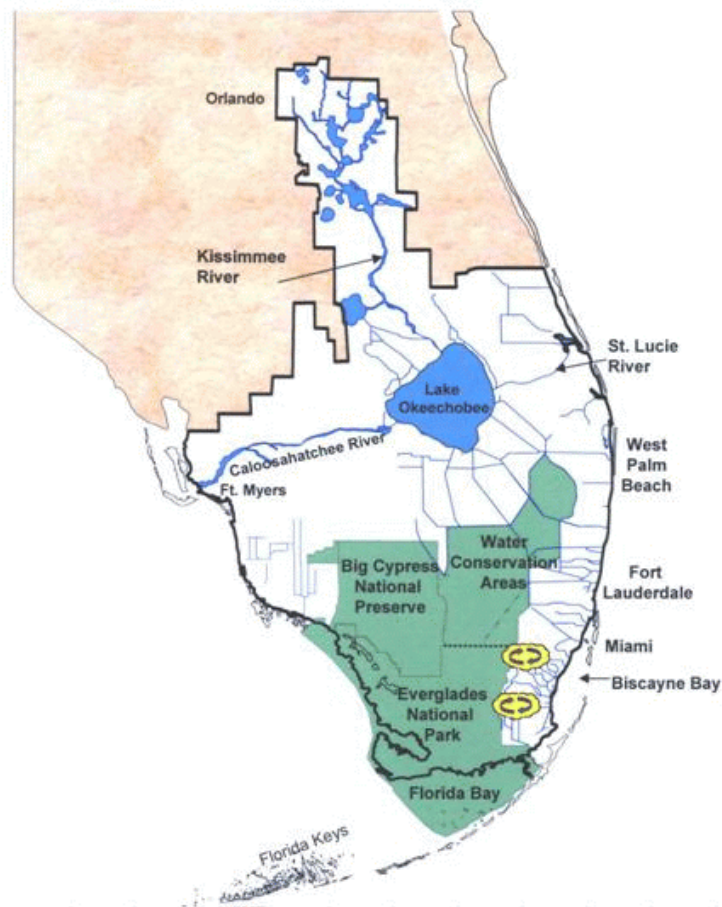


Figure 6. Comprehensive Everglades Restoration Plan wastewater reuse components.

Wastewater Reuse

Wastewater reuse facilities (Fig. 6) will provide treatment of urban wastewater that could then be re-used for natural system water supply. These facilities would be located in Miami-Dade County.

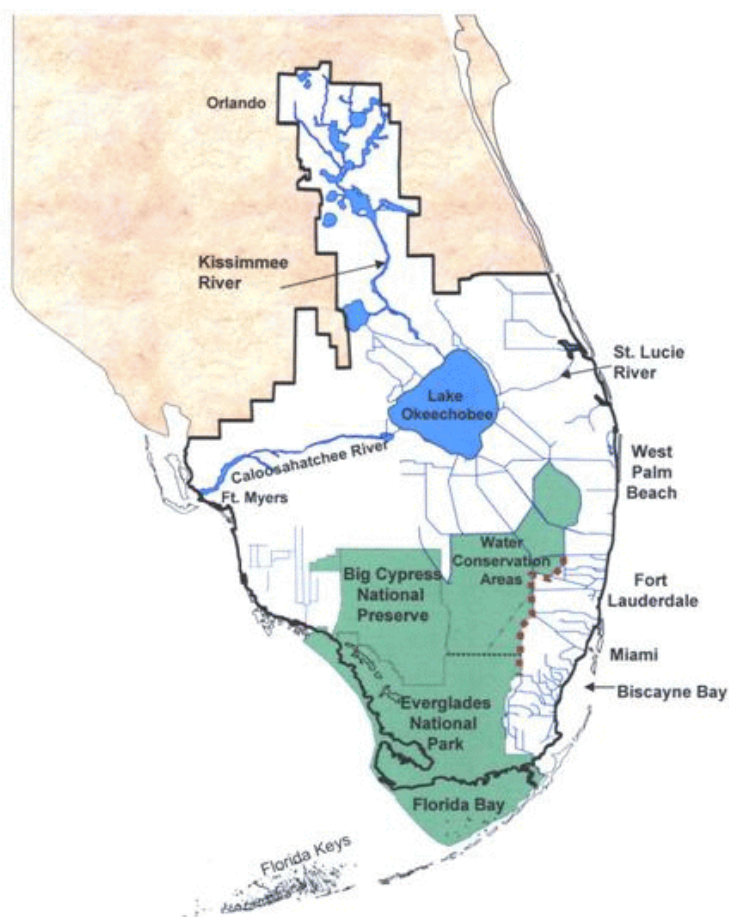


Figure 7. Comprehensive Everglades Restoration Plan seepage management components.

Seepage Management

Seepage management features (Fig. 7) are planned for the eastern borders of WCAs 2B, 3A and 3B and northeast Shark Slough and will provide a semi-permeable subsurface barrier between parts of the natural system and the urban environment. These barriers will serve the dual roles of reducing loss of clean natural system water through seepage into the urban areas and reducing flooding of urban areas by reducing groundwater flow into the urban areas during storm events.

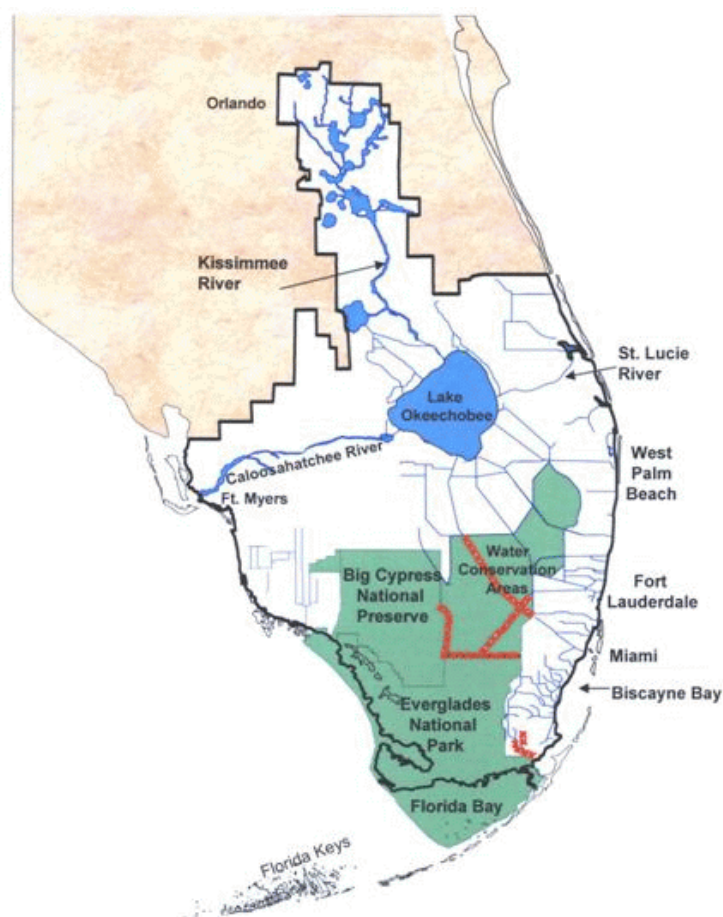


Figure 8. Comprehensive Everglades Restoration Plan barrier removal components.

Barrier Removal

The CERP contemplates removal of several existing water control structures, including large portions of the L-28, Miami and Tamiami Trail canals and levees (Fig. 8). This would provide more natural free flow of water between large areas that are currently separated and would allow many fish and wildlife species to move more freely between habitats. Additional barrier removal is planned for the C-111 Basin in order to restore sheetflow to northeastern Florida Bay.

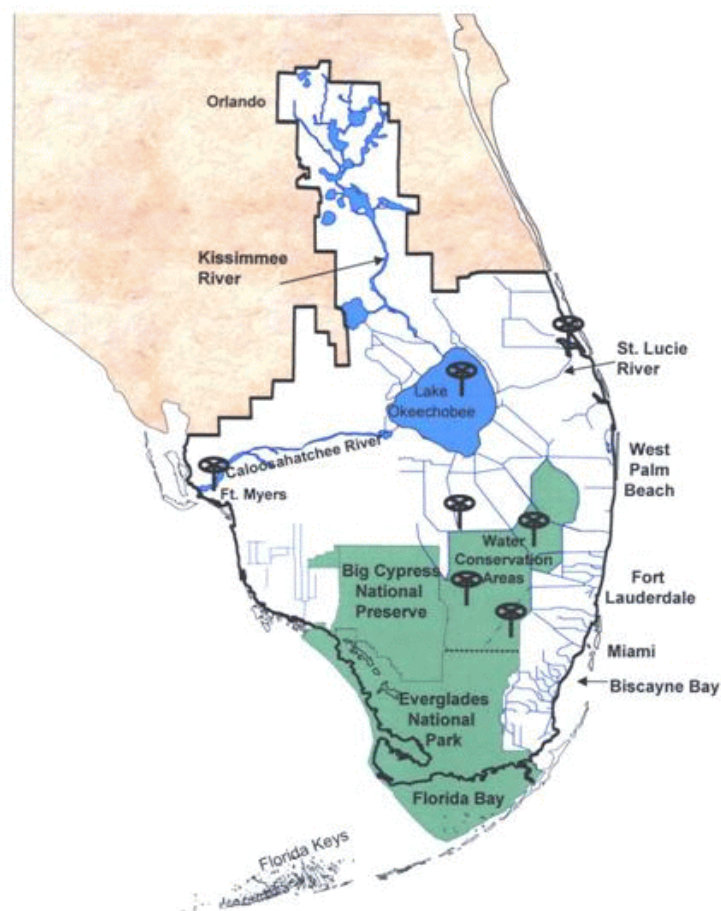


Figure 9. Comprehensive Everglades Restoration Plan operation components.

Operational Changes

Several new water control structures and operational changes (Fig. 9) are proposed in the CERP. These structures and operations provide additional flexibility in the control of timing, direction and volume of water flow necessary to improve and maintain natural habitats and to provide water supply and flood control. For example, new structures proposed for the southern border of Water Conservation Area (WCA) 2B and eastern border of Everglades National Park (ENP) will allow the movement of excess water from WCA 2B to the Taylor Slough area in ENP where it is needed to restore natural conditions. Another example is a new weir that would partially replace the existing L-67A canal and levee, allowing more natural free flow of water from WCA 3A to WCA 3B. Numerous other operational changes would occur throughout the CERP area.

Methods

The individual project analyses presented below were developed as a program-level planning tool to maximize benefits and minimizing impacts to listed species and the ecosystems on which they depend during siting and construction of CERP features. They focus on a program-level analysis of possible impacts and benefits to listed species resulting from the construction or “footprint” of CERP along with recommendations for maximizing these benefits and minimizing these impacts. The hydrologic, or downstream, effects of CERP components are addressed here only for those CERP components that are not included in South Florida Water Management Model modeling conducted as part of the ICU. Our analysis of the hydrologic effects of those components modeled as part of ICU will be presented in a later PAR.

It is important that readers keep in mind the limitations of our analysis. First, this analysis is intended for planning purposes only as a tool to assist the Corps, District and stakeholders in the siting and construction of CERP infrastructure, and does not anticipate take of listed species as defined by the ESA. It addresses the direct effects (immediate effects of the action) of the projects only. It does not address indirect effects (those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur), cumulative effects (those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the Federal project area), effects of interrelated activities (effects of actions that are part of a larger action and depend on the larger action for their justification) or interdependent activities (effects of actions having no independent utility apart from the proposed action) to listed species that would need to be addressed in a Biological Assessment prepared by the Corps as part of the ICU. Second, in most cases our analysis is based on the limited information available for projects that are in the early stages of planning and projects a worst case scenario based on that limited information. It is likely that the potential impacts and benefits presented are uncertain and that actual project impacts will be both different and smaller than presented as PDTs proceed with planning processes that narrow possible infrastructure locations and favor alternatives with lesser impacts and greater benefits. Third, this report does not include the hydrologic effects of CERP projects in the remaining Everglades. We expect that significant benefits to wetland-dependent listed species and wetland ecosystems will be realized through these hydrologic effects that will be analyzed in a later report.

The individual project analyses were drafted by the Service biologist who has been assigned the lead for that project and were developed based on the best available scientific information for each of the listed species and the most detailed information available on each of the CERP projects. CERP components were grouped into discrete projects according to *CERP Guidance Memorandum 2.01 Project Names* and arranged according to the Work Breakdown Structure Numbers (WBS) in the Guidance Memorandum. Figures and tables are named sequentially within each project section sequentially beginning with the WBS number. Each analysis was accomplished through several general steps. First the action was identified and de-constructed into its component parts. For example, an STA’s component parts may include construction of marsh areas, levees containing and compartmentalizing the marsh areas, inflow and outflow

pumps, new access roads and new powerlines as well as a duration of construction activity and a set of operations. Each of these activities has the potential to affect listed species in different ways; identifying each activity ensures that potential effects were fully accounted for each activity. The next step was to identify the action area or likely site on which each activity would occur. The results of these two steps form the project description portion of each project analysis.

Project description development

The project descriptions were developed based on the most recent documentation available for the project and, for those projects that have them, through discussion with Corps and South Florida Water Management District (District) project managers. Since projects are in different stages of planning, the sources and level of detail for the project descriptions varies, with some descriptions based on recent and detailed information available in Project Implementation Reports (PIRs) and others based on only the limited information available in the Restudy (Corps 1999). In some cases, likely sites for project features were known and used in the analysis. In many cases, siting of project features is not finalized and available information on siting ranged from somewhat to very uncertain. In these cases, the project biologists worked with Corps and District project managers, PDTs, and other knowledgeable individuals to make reasonable assumptions about likely siting. In a few cases, very high uncertainty on siting led the project biologist to describe more than one possible siting scenario representing reasonable assumptions on the potential range of siting possibilities and listed species impacts. When specific information was not available, one siting option represents a reasonable worst case scenario for listed species impacts to provide a conservative analysis. Each project description was shared in draft form with the Corps and District project managers for those projects that have project managers assigned, and comments received were incorporated. For projects that did not yet have project managers assigned, Service biologists attempted to find Corps and District staff who were familiar with the project and shared drafts with those individuals. Service coordination with the Corps and the District for each project through August 2003 is summarized at the end of each project analyzed in this PAR. Ongoing Service coordination for active projects is summarized in quarterly reports from the Service to the Corps.

Exposure analysis

The next step in the analysis was the exposure analysis or the identification of species and habitats, and designated critical habitats, likely to be exposed to the activities identified in the project descriptions. Sixteen individual federally listed species (two mammal, eight bird, two reptile, one invertebrate, and three plant species), four groups of federally listed species (consisting of two skinks, five sea turtles, two pine rockland plants, and 20 high pine-scrub plants representing 29 additional individual species), and federally designated critical habitat for four species (listed resources) were identified that may be affected by the CERP projects (Table M-1). Seventeen MSRP ecological communities may be affected by CERP projects (Table M-2).

Table M-1. Initial analysis of federally designated critical habitat and listed species occurrences by Comprehensive Everglades Restoration Plan project. x = species or critical habitat may occur within project footprint.

WBS	Project Name	Crocodile critical habitat	Manatee critical habitat	CSS sparrow critical habitat	Snail kite critical habitat	West Indian manatee	Florida panther	Audubon's crested caracara	Bald eagle	Cape Sable seaside sparrow	Everglade snail kite	Florida grasshopper sparrow	Florida scrub-jay	Red-cockaded woodpecker	Whooping crane	Wood stork	American crocodile	Eastern indigo snake	Sand & blue-tail mole skinks	Sea turtles ¹	Schaus swallowtail butterfly	Beautiful pawpaw	High pine-scrub plants ²	Okeechobee gourd	Pine Rockland Plants ³	Tiny polygala
1,2	Lake Okeechobee Watershed, Lake Istokpoga Regulation Schedule					X	X	X	X		X	X	X	X	X	X		X	X				X	X		
3	Lake Okeechobee Aquifer Storage and Recovery (ASR)					X	X	X	X		X					X		X						X		
4,5,6, 33	C-43 Basin Storage Reservoir, ASR, and Caloosahatchee Backpumping with Stormwater Treatment					X	X	X	X		X	X	X	X		X		X		X		X		X		
7	Indian River Lagoon - South					X	X	X	X		X		X	X		X		X		X			X			
8,9	Everglades Agricultural Area Storage Reservoirs 1 & 2					X	X	X	X		X					X		X						X		
10	Big Cypress / L-28 Interceptor Modifications						X		X		X					X		X								
11	Flow to Northwest and Central Water Conservation Area 3A						X		X		X					X		X								
12	WCA-3 Decomp. and Sheet Flow Enhancement - Part 1				X	X	X				X					X		X						X		
13	WCA-3 Decomp. and Sheet Flow Enhancement - Part 2				X	X	X				X					X		X								
14	Loxahatchee National Wildlife Refuge Internal Canal Structures															X										
15,16	Modify Holey Land and Rotenberger WMAs Operation Plans															X										
17	North Palm Beach County - Part 1		X					X	X		X		X	X		X		X							X	X
18	North Palm Beach County - Part 2							X	X		X		X	X		X		X							X	X
20, 21	Palm Beach County Agriculture Reserve Reservoir and ASR								X		X					X		X								
22	Hillsboro Aquifer Storage and Recovery - Part 2								X							X		X								
23	Flow to Eastern Water Conservation Area					X	X		X		X					X		X								
24	Broward County Secondary Canal System					X			X							X		X								
25	North Lake Belt Storage Area					X			X		X					X		X								
26	Central Lake Belt Storage Area					X			X		X					X		X								
27	Everglades National Park Seepage Management					X	X		X		X					X		X								
28	Biscayne Bay Coastal Wetlands					X	X		X							X	X	X		X	X				X	X
29	C-111 Spreader Canal	X		X		X	X		X	X	X					X	X	X								
30	Southern Golden Gate Estates Hydrologic Restoration		X			X	X		X		X			X		X	X	X		X						
31	Florida Keys Tidal Restoration					X			X								X	X								
32	Lake Okeechobee Aquifer Storage and Recovery Pilot					X		X	X							X		X						X		
34	Hillsboro Aquifer Storage & Recovery Pilot																X									

Table M-1 (cont.). Designated critical habitat and listed species occurrences by Comprehensive Everglades Restoration Plan (CERP) project. x = may occur within project footprint.

WBS	Project Name	Crocodile critical habitat	Manatee critical habitat	CSS sparrow critical habitat	Snail kite critical habitat	West Indian manatee	Florida panther	Audubon's crested caracara	Bald eagle	Cape Sable seaside sparrow	Everglade snail kite	Florida grasshopper sparrow	Florida scrub-jay	Red-cockaded woodpecker	Whooping crane	Wood stork	American crocodile	Eastern indigo snake	Sand & blue-tail mole skinks	Sea turtles ¹	Schaus swallowtail butterfly	Beautiful pawpaw	High pine-scrub plants ²	Okeechobee gourd	Pine Rockland Plants ³	Tiny polygala
35	Lake Belt In-Ground Reservoir Technology Pilot					x											x									
36	L-31N Seepage Management Pilot						x		x							x		x								
37,97,98	Wastewater Reuse Technology Pilot, West, East Miami-Dade Reuse															x	x	x								
38	Acme Basin B Discharge															x		x								
39	Strazzulla Wetlands										x					x		x								
40	Hillsboro Site 1 Impoundment								x							x		x								
43	Bird Drive Recharge Area					x										x		x								
44	Aquifer Storage and Recovery Regional Study					x																				
45	Broward County Water Preserve Areas					x			x		x					x		x								
46	C-4 Structure					x												x								
47	WCA 3A/3B Flows to Central Lake Belt					x												x								
48	WCA 2B Flows to ENP					x					x					x		x								
49	WPA Conveyance					x										x		x								
90	Miccosukee Water Management Plan						x		x		x					x		x								
91	Winsberg Farm Wetland Restoration								x		x					x		x								
92	Restore Pineland/Tropical Hardwood Hammocks C-111 Basin						x											x								
93	Henderson Creek / Belle Meade Restoration					x										x	x	x								
94	Lakes Park Restoration					x			x							x	x	x								
95	Melaleuca Eradication and Other Exotic Plants - none																									
54	TOTAL number of projects identified	1	2	1	2	32	22	13	33	1	29	6	9	10	1	44	9	49	2	7	1	4	3	11	3	3

¹ - sea turtles include: green, hawksbill, Kemps ridley, leatherback, and loggerhead sea turtles.

² - high pine-scrub plants include: Avon park harebells, Britton's beargrass, Carter's mustard, Highlands scrub hypericum, Florida bonamia, Florida perforate cladonia, Florida ziziphus, Garrett's mint, Lewton's polygala, papery whitlow-wort, pigeon wings, pygmy fringe-tree, sandlace, scrub blazing star, scrub buckwheat, scrub plum, scrub mint, short-leaved rosemary, snakeroot, and wireweed.

³ - pine rockland plants include: Crenulated lead plant and Garber's spurge

Table M-2. Initial analysis of Multi-species Recovery Plan (MSRP) ecological community occurrences by Comprehensive Everglades Restoration Plan (CERP) project.

X = ecological community may occur within project footprint.

WBS	CERP Project	High pine	Scrub, Scrubby Flatwoods	Mesic temperate hammock	Pine rockland	Mesic pine flatwoods	Hydric pine flatwoods	Drv prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp	Mangrove	Saltmarsh	Seagrass	Nearshore reef
1,2,3,32	Lake Okeechobee watershed	x	x	x		x			x	x	x							
4,5,6,33	Caloosahatchee basin								x		x	x	x	x				
7	Indian River Lagoon - South	x	x	x		x	x	x		x	x	x	x	x	x			
8,9	Everglades Agricultural Area Storage Reservoirs 1 & 2									x	x	x						
10,11	Big Cypress / L-28 Interceptor Modifications									x				x				
12,13	WCA-3 Decomp. and Sheet Flow Enhancement 1 & 2									x	x	x	x	x				
15	Modify Holey Land WMAs Operations										x	x						
16	Modify Rotenberger WMAs Operations							x			x	x						
17,18	North Palm Beach County projects			x		x				x	x	x	x	x				
20,21	Palm Beach County Agricultural Reserve projects	x										x	x	x				
22,34,40	Hillsboro projects	x		x		x					x	x						
23	Flow to Eastern Water Conservation Area										x							
25	North Lake Belt Storage Area	x			x					x	x	x						
27	Everglades National Park Seepage Management										x							
28	Biscayne Bay Coastal Wetlands					x				x	x	x			x	x	x	x
29	C-111 Spreader Canal										x	x			x		x	
30	Southern Golden Gate Estates Hydrologic Restoration	x				x	x	x		x	x	x	x	x	x	x		
31	Florida Keys Tidal Restoration														x		x	
36	L-31N Seepage Management Pilot										x	x						
39	Strazzulla Wetlands			x			x			x	x	x	x	x				
43	Bird Drive Recharge Area										x	x						
45	Broward County Water Preserve Areas	x	x	x							x	x						
48	WCA 2B Flows to ENP										x							
49	WPA Conveyance									x								
90	Miccosukee Water Management Plan			x						x	x		x	x	x	x		
93	Henderson Creek / Belle Meade Restoration	x				x	x	x		x	x	x	x	x	x	x		
94	Lakes Park Restoration					x												
97	South Miami-Dade Wastewater Reuse														x			
41	TOTAL number of projects identified	14	6	13	1	14	4	4	8	22	33	27	15	17	8	4	3	1

¹ - MSRP ecological communities do not occur within the CERP footprint of projects 14, 24, 26, 35, 37, 38, 44, 46, 47, 48, 91, 92, 95, and 97.

Service staff developed several tools to ensure consistency in analyzing exposure of listed resources to CERP activities. Table M-3 is a matrix of the listed species, designated critical habitats, and MSRP ecological communities that may be affected by CERP features and the 1995 Florida Land Use, Cover and Forms Classification System (FLUCCS) (Department of Transportation [DOT] 1999) codes that occur within the CERP project area. Service staff consulted the best available scientific information and species experts to determine which FLUCCS codes represented suitable habitat for each species and entered this information in the matrix. Most Service CERP project lead biologists identified FLUCCS codes occurring in potential sites of the project features and compared these to the Table M-3 matrix to determine potential habitats that could be affected. In a few cases, more detailed or more recent information on habitat types within the footprints was available and this was used instead of the FLUCCS data. Service biologists assessed potential critical habitat exposure by comparing project potential footprint locations with maps of designated critical habitat (Fig. 10 through Fig. 13).

Exposure analysis tools to assess potential effects on the West-Indian manatee include the Central and Southern Florida Project Manatee Accessibility (Draft) map (Fig. 14). The panther exposure analysis tool we developed, the CERP Landscape Level Project Planning/Siting Map for Panther Conservation (Fig. 15), is based on the *Landscape Conservation Strategy for the Florida panther in South Florida* (Service 2002a) prepared by the Panther subteam of the Multi-species Ecosystem Implementation Team. This map shows various zones and land covers used to evaluate potential panther effects. In order to provide a conservative analysis, we assumed that all suitable habitat was occupied by the pertinent listed species.

MSRP ecological communities

Ecological communities likely to be exposed to effects from CERP project implementation were also identified in this step. A table of MSRP ecological communities occurrence by CERP project was developed (Table M-2). A matrix of FLUCCS codes and MSRP ecological communities was developed similar to that described for listed species (Table M-3). Because there were no FLUCCS codes or acres coded in appropriate FLUCCS codes for cutthroat grass and nearshore reef communities, the MSRP (Service 1999) and best professional judgement was used to determine which CERP projects may affect those communities in table M-2. A Geographic Information System (GIS) coverage of CERP project footprints was acquired from the District. In some cases, CERP project footprints were than larger analysis areas that represented planning area for multiple projects (*e.g.*, Lake Okeechobee watershed, Caloosahatchee basin). In other cases, CERP project footprints contained no known natural MSRP ecological communities.

Table M-3. Initial analysis of federally listed species and designated critical habitats, and Multi-species Recovery Plan (MSRP) ecological communities that may be affected by CERP features and the 1995 Florida Land Use, Cover and Forms Classification System (FLUCCS) (Department of Transportation [DOT] 1999) codes that occur within the CERP project area.

FLUCCS Code	Species/Ecological Community	Florida panther ¹	West Indian manatee	Audubon's caracara	Bald eagle	Cape Sable seaside sparrow	Everglade snail kite	Florida grasshopper sparrow	Florida scrub-jay	Red-cockaded woodpecker	Wood stork	American crocodile	Eastern indigo snake	Sea turtles ²	Beautiful pawpaw	High pine-scrub plants ³	Okeechobee gourd	Tiny polygala	High pine	Scrub, Scrubby Flatwoods	Mesic temperate hammock	Pine rockland	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp	Mangrove	Saltmarsh	Seagrass	Nearshore reef ⁴
100	Urban and built-up	0																																	
110	Residential low density	0									p		x																						
120	Residential med density	0									p		x																						
130	Residential high density	0											v																						
140	Commercial and Service	0											v																						
150	Industrial	0											v																						
160	Extractive	0											v																						
170	Institutional	0											v																						
180	Recreational	0											v																						
181	Swimming beach	0										r		x																					
182	Golf courses	0									p		v																						
184	Marinas and fish camps	0									p	r	v																						
188	Historical sites	0											v																						
189	Other recreational	0											v																						
190	Open land	0		a									x																						
200	Agriculture																																		
210	Croplands and pasturelands			x							x		x																						
211	Improved pasture	L		x	n			x	o		x		x																						

FLUCCS Code	Species/Ecological Community	Florida panther ¹	West Indian manatee	Audubon's caracara	Bald eagle	Cape Sable seaside sparrow	Everglade snail kite	Florida grasshopper sparrow	Florida scrub-jay	Red-cockaded woodpecker	Wood stork	American crocodile	Eastern indigo snake	Sea turtles ²	Beautiful pawpaw	High pine-scrub plants ³	Okeechobee gourd	Tiny polygala	High pine	Scrub, Scrubby Flatwoods	Mesic temperate hammock	Pine rockland	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp	Mangrove	Saltmarsh	Seagrass	Nearshore reef ⁴
212	Unimproved pastures	M		x	n			x	o		x		x																						
213	Woodland pastures	M		x	n				o	w	x		x																						
214	Row crops	L		x							x		x																						
215	Field crops	L		x				x			x		x																						
2156	Sugar Cane	L		a							x		x																						
220	Tree crops	L		a									x																						
221	Citrus	L		a					o		p		x																						
230	Feeding operations	L																																	
240	Nurseries and vineyards	L											x																						
242	Sod farms	L		x				x			p		x																						
250	Specialty farms	L																																	
251	Horse farms	L		x									x																						
252	Dairies	L		x									x																						
253	Kennels	L																																	
254	Aquaculture	L		x							p		x																						
259	Other	L		x									x																						
260	Other open lands rural	L		x									x																						
261	Fallow crop land	L		x				a					x																						
300	Rangelands	M											x																						
310	Herbaceous	M		x				x	o				x												x										
320	Shrub and Brushland	M											x																						
321	Palmetto Prairie	M		x				x	o				x													x									

FLUCCS Code	Species/Ecological Community	Florida panther ¹	West Indian manatee	Audubon's caracara	Bald eagle	Cape Sable seaside sparrow	Everglade snail kite	Florida grasshopper sparrow	Florida scrub-jay	Red-cockaded woodpecker	Wood stork	American crocodile	Eastern indigo snake	Sea turtles ²	Beautiful pawpaw	High pine-scrub plants ³	Okeechobee gourd	Tiny polygala	High pine	Scrub, Scrubby Flatwoods	Mesic temperate hammock	Pine rockland	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp	Mangrove	Saltmarsh	Seagrass	Nearshore reef ⁴
322	Coastal scrub	M						x					x				y			x															
329	Other Shrub and Brush	M	x				t	o					x							x															
330	Mixed rangelands	M	x				t	o					x																						
400	Upland forests	H											x																						
410	Upland coniferous forests	H											x																						
411	Pine flatwoods	H		x				o	x				x		b							x	x												
412	Longleaf pine/xeric oak	H	a	x				x	x				x			x	y	x	x																
413	Sand pine	H						x	x				x			x			x																
414	Pine - mesic oak	H		x				x	x				x				y																		
419	Other pines	H		x					x				x																						
420	Upland hardwood forests	H											x																						
421	Xeric oak	H	a					x					x		x		y		x																
423	Oak - Pine - Hickory	H	a						x				x								x														
425	Temperate Hardwoods	H	a										x								x														
426	Tropical hardwoods	H	a						w				x																						
427	Live oak	H	a	n									x								x														
428	Cabbage palm	H	x						w				x								x														
429	Wax myrtle - willow	H	a										x																						
430	Upland hardwood forests (cont.)	H	a										x																						
431	Beech-magnolia	H	a										x								x														
432	Sand live oak	H	a					x					x						x																
433	Western Everglade hardwood	H	a										x																						

FLUCCS Code	Species/Ecological Community	Florida panther ¹	West Indian manatee	Audubon's caracara	Bald eagle	Cape Sable seaside sparrow	Everglade snail kite	Florida grasshopper sparrow	Florida scrub-jay	Red-cockaded woodpecker	Wood stork	American crocodile	Eastern indigo snake	Sea turtles ²	Beautiful pawpaw	High pine-scrub plants ³	Okeechobee gourd	Tiny polygala	High pine	Scrub, Scrubby Flatwoods	Mesic temperate hammock	Pine rockland	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp	Mangrove	Saltmarsh	Seagrass	Nearshore reef ⁴
434	Hardwood -conifer mixed	H		a						x			x					q																	
435	Dead trees	H		a	n					w			x																						
437	Australian pine	H		a	n								x																						
438	Mixed hardwoods	H		a						w			x																						
439	Other hardwoods	H		a						w			x																						
440	Tree plantations	M											x																						
441	Coniferous plantations	M		a					o	x			x			x																			
442	Hardwood plantations	M		a									x																						
443	Forest regeneration	M		x					o	x			x																						
500	Water	0			f																														
510	Streams and waterways	0	c		f							r																							
520	Lakes	0	c		f																														
530	Reservoirs	0			f																														
540	Bays and Estuaries	0	x		f						x	r																							
560	Slough waters	0			f						x	r																							
600	Wetlands	H																																	
610	Wetland hardwood forests	H			n								x																						
611	Bay swamps	H			n	m					x	r	x																x	x	x				
612	Mangrove swamps	L			n						x	r	x																				x		
613	Gum swamps	H			n	m					x		x																	x	x				
614	Titi swamps	H			n								x															x			x				
615	Stream and lake swamps	H			n	m					x		x																			x			

FLUCCS Code	Species/Ecological Community	Florida panther ¹	West Indian manatee	Audubon's caracara	Bald eagle	Cape Sable seaside sparrow	Everglade snail kite	Florida grasshopper sparrow	Florida scrub-jay	Red-cockaded woodpecker	Wood stork	American crocodile	Eastern indigo snake	Sea turtles ²	Beautiful pawpaw	High pine-scrub plants ³	Okeechobee gourd	Tiny polygala	High pine	Scrub, Scrubby Flatwoods	Mesic temperate hammock	Pine rockland	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp	Mangrove	Saltmarsh	Seagrass	Nearshore reef ⁴
616	Inland ponds and sloughs	H		a	n	m				x		x					g													x					
617	Mixed wetland hardwoods	H			n	m				x	x	x					g												x	x	x				
618	Willow and Elderberry	H				m				x	x																								
620	Wetland coniferous forests	H										x																							
621	Cypress	H			x	x				w	x	x					g													x	x				
622	Pond pine	H			n	x				x	x	x																			x				
623	Atlantic white cedar	H			n								x																						
624	Cypress-pine-cabbage palm	H		x	n					x	x	x												x											
625	Wet pinelands	H			n						x	x												x											
626	Hydric pine savannah	H			n						x	x												x											
627	Slash pine swamp forest	H			n						x	x																				x			
630	Wetland forested mix	H			n		x			w	x		x																						
640	Vegetated non-forested wetlands	H			f																														
641	Freshwater marshes	H		x	f	h	x				x		i				g											x							
642	Saltwater marshes	H			f		m				x	r																					x		
643	Wet prairies	H		x	f	h	x	t			x		i														x								
644	Emergent aquatic vegetation	H			f		x				x		i				g											x							
645	Submergent aquatic vegetation	H	c		f		m						i				g																		
646	Treeless hydric savannah	H																									x	x							
650	Non-vegetated	0																									x	x							
651	Tidal Flats	0									x	r																							
652	Shorelines	0									x	r	x	s																					
653	Intermittent ponds	0									x		x																						

FLUCCS Code	Species/Ecological Community	Florida panther ¹	West Indian manatee	Audubon's caracara	Bald eagle	Cape Sable seaside sparrow	Everglade snail kite	Florida grasshopper sparrow	Florida scrub-jay	Red-cockaded woodpecker	Wood stork	American crocodile	Eastern indigo snake	Sea turtles ²	Beautiful pawpaw	High pine-scrub plants ³	Okeechobee gourd	Tiny polygala	High pine	Scrub, Scrubby Flatwoods	Mesic temperate hammock	Pine rockland	Mesic pine flatwoods	Hydric pine flatwoods	Dry prairie	Cutthroat grass	Wet prairie	Freshwater marsh	Seepage swamp	Flowing water swamp	Pond swamp	Mangrove	Saltmarsh	Seagrass	Nearshore reef ⁴
654	Oyster bars	0								x																									
700	Barren land																																		
710	Beaches other than swimming	0										r		s																					
720	Sand other than beaches	0											v																						
730	Exposed rock	0																																	
740	Disturbed land	L																																	
741	Rural land in transition	L						o					x																						
745	Burned areas	L						o					x																						
800	Transportation/Communication	0																																	
810	Transportation	0																																	
812	Railroads	0		a																															
814	Roads and highways	0		a																															
816	Canals and locks	0	c		f							r																							
820	Communication	0											v																						
830	Utilities	0											v																						
900	Special classification	0	d							d			d																						
910	Vegetation	0																																	
911	Seagrass	0	d							d			d																					x	

¹ - panther; number (or range) of high (H), medium (M), low (L), and zero (0) value acres likely to be effected.

² - sea turtles include green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles.

-
- ³ - high pine-scrub plants that may be effected by CERP include Avon Park harebells, Britton's beargrass, Carter's mustard, Highlands scrub hypericum, Florida bonamia, Florida perforate cladonia, Florida ziziphus, Garrett's mint, Lewton's polygala, papery whitlow-wort, pigeon wings, pygmy fringe-tree, sandlace, scrub blazing star, scrub buckwheat, scrub plum, scrub mint, short-leaved rosemary, snakeroot, and wireweed.
- ⁴ - nearshore reef; no FLUCCS codes apply.
- a - caracara; when associated with nesting substrate (cabbage palms or lightly wooded areas with saw palmetto, scrub oaks, or cypress).
- b - beautiful pawpaw; within Lee and Charlotte Counties.
- c - manatees; with manatee access.
- d - manatees, wood stork, sea turtles; code not used in FLUCCS, use information from DEP seagrass coverage.
- f - potential bald eagle foraging; when open water-forest associated within 3 km, use [816] when Corps "C" or "L" designation used.
- g - Okeechobee gourd; within the Herbert Hoover dike around Lake Okeechobee, and Kissimmee and Upper St. Johns River watersheds.
- h - Cape Sable seaside sparrow; when hydroperiod is between two (2) to six (6) months, February to July drydown.
- i - eastern indigo snake; when tree islands are present and when uplands are intermixed with other non-forested wetlands.
- m - Everglade snail kite; when associated with non-forested freshwater marsh with emergent vegetation.
- n - potential bald eagle nesting; when forested-open water associated within 3 km, use [427] in Kissimmee area, [612] along SW coast and Keys.
- o - scrub-jay; may be considered atypical, do not count acres for initial effects, but should be surveyed when site-specific areas are identified.
- p - wood stork; for citrus [221] use two (2) percent of area, for other codes calculate area to account for suitable storm water pond.
- q - tiny polygala; within Miami-Dade County.
- r - crocodile; within crocodile consultation area (Aug 2003), designated critical habitat, or Turkey Point power plant.
- s - sea turtles; when associated with saltwater or brackish water.
- t - grasshopper sparrow; when less than 1 tree/100 acre (Myers and Ewel. 1990).
- v - eastern indigo snake; when associated with vegetation, debris, or other cover.
- w - red-cockaded woodpecker; when pines are present.
- y - tiny polygala; within Martin and Palm Beach Counties.
-

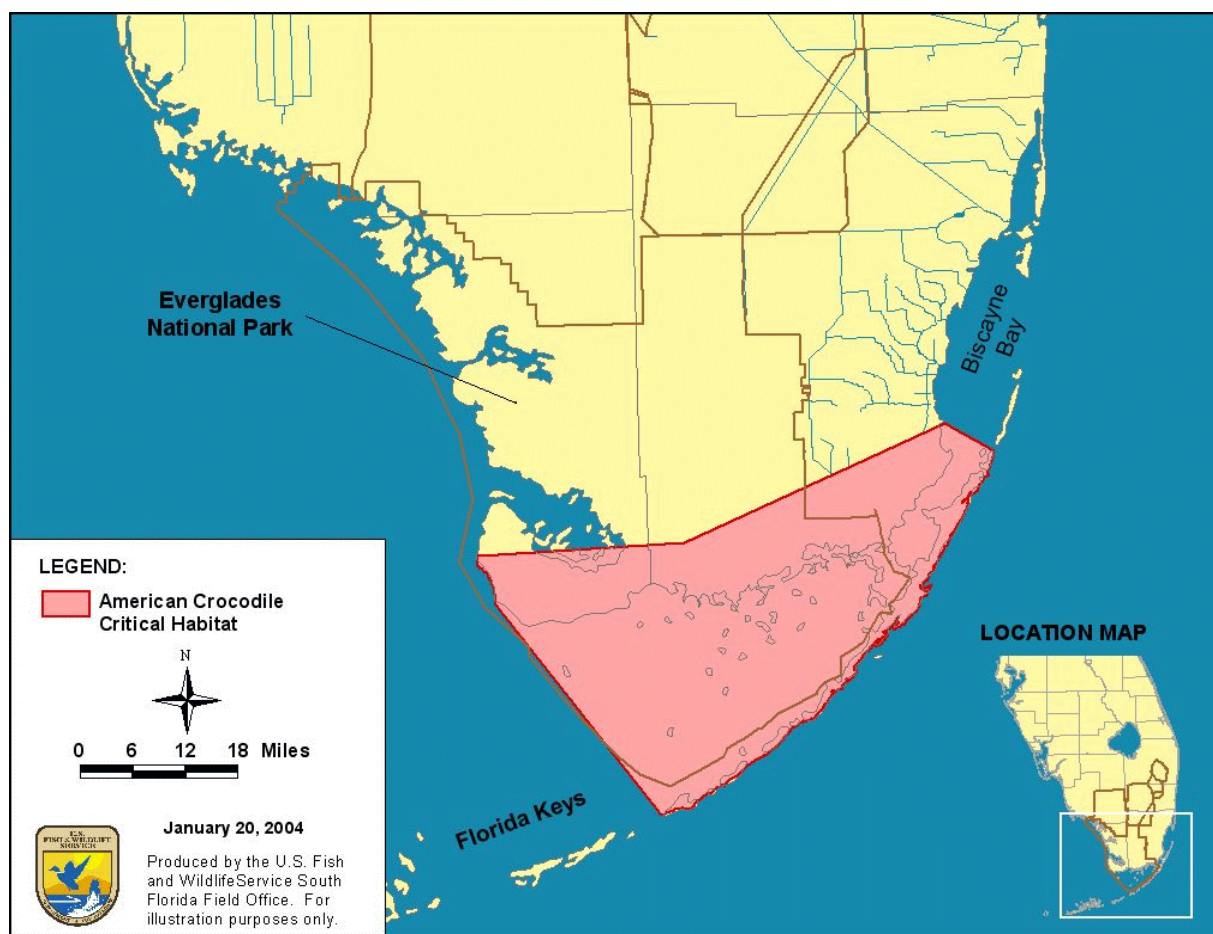


Figure 10. Location of designated American crocodile critical habitat.

Response analysis

The final step in each analysis was response analysis or identification of the likely response of species and habitats to each of the project activities. Project leads consulted the MSRP, other available scientific information and species experts to determine likely responses. For some species, detailed guidance was developed by Service staff to ensure consistency in cases where differing conclusions could be reached based on the same scientific information and is outlined here by species.

American crocodile

We assumed that filling canals within suitable habitat eliminates feeding and deep water refugia habitat and that new canals provide the same. Roadside fringe with mangroves was considered potential foraging and basking habitat as were new berms or levees constructed within appropriate habitat. Road removal for rehydration was not considered an adverse effect when no use for nesting was documented since suitable habitat would replace the former road area.

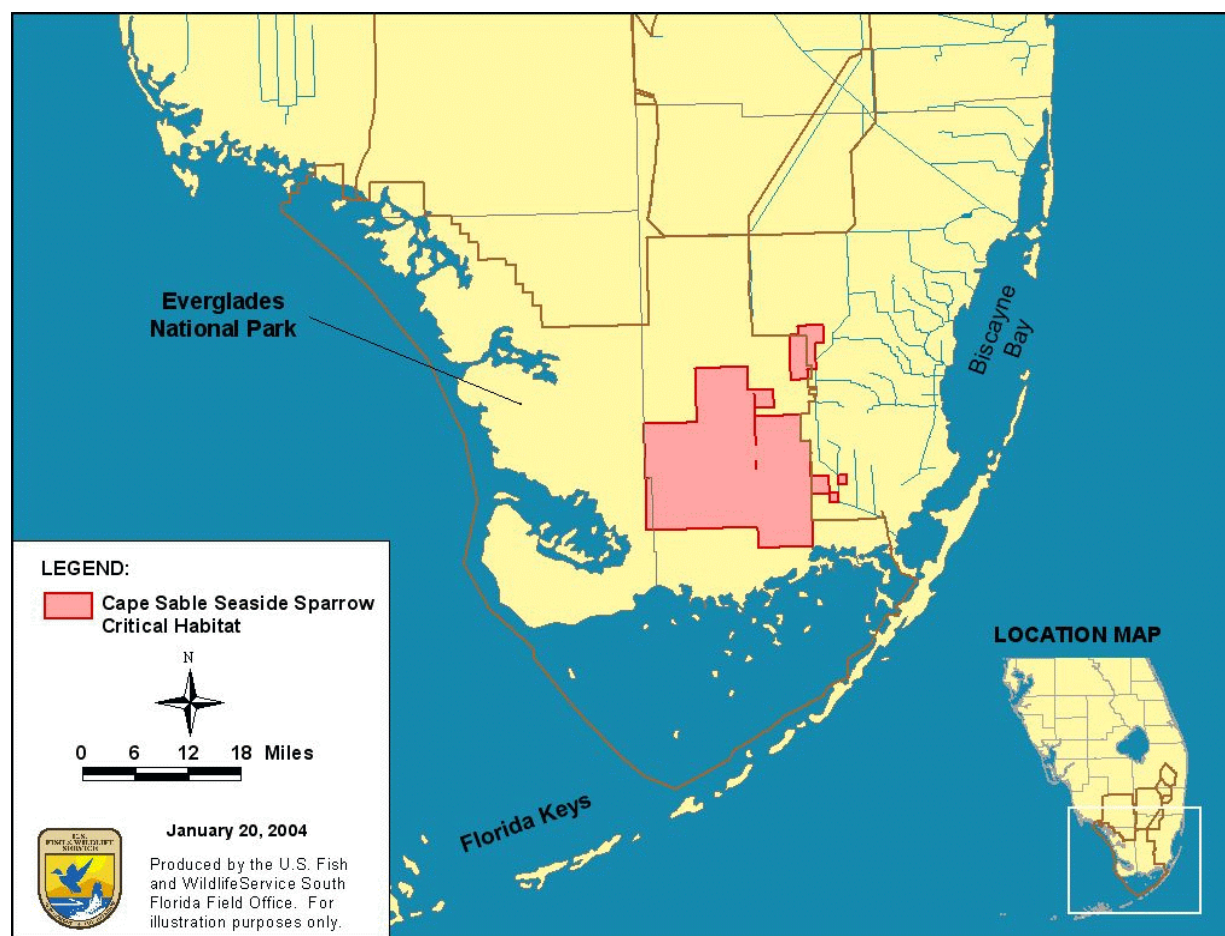


Figure 11. Location of designated Cape Sable seaside sparrow critical habitat.

Audubon's crested caracara

In accordance with the Service's *Habitat Management Guidelines For Audubon's Crested Caracara In Central and Southern Florida*, we established a 985-foot Primary Zone and a 6,600-foot Secondary Zone around known nesting trees. Habitat loss or disturbance within these zones or within a known juvenile caracara congregation area was considered a potential adverse effect. Foraging disturbance due to construction and loss of foraging habitat outside these nesting and juvenile congregation areas was not considered adverse and was noted as an issue that needs follow-up when project-specific section 7 consultations are performed. In some cases where project siting information was very uncertain or where nesting tree locations were not available, we produced a conservative analysis by assuming that all suitable habitat was within a nesting zone. Pasture restoration to original wetlands (e.g., IRL natural retention areas) was considered neutral for caracara if the hydrology would allow trees, especially nesting trees, to remain.

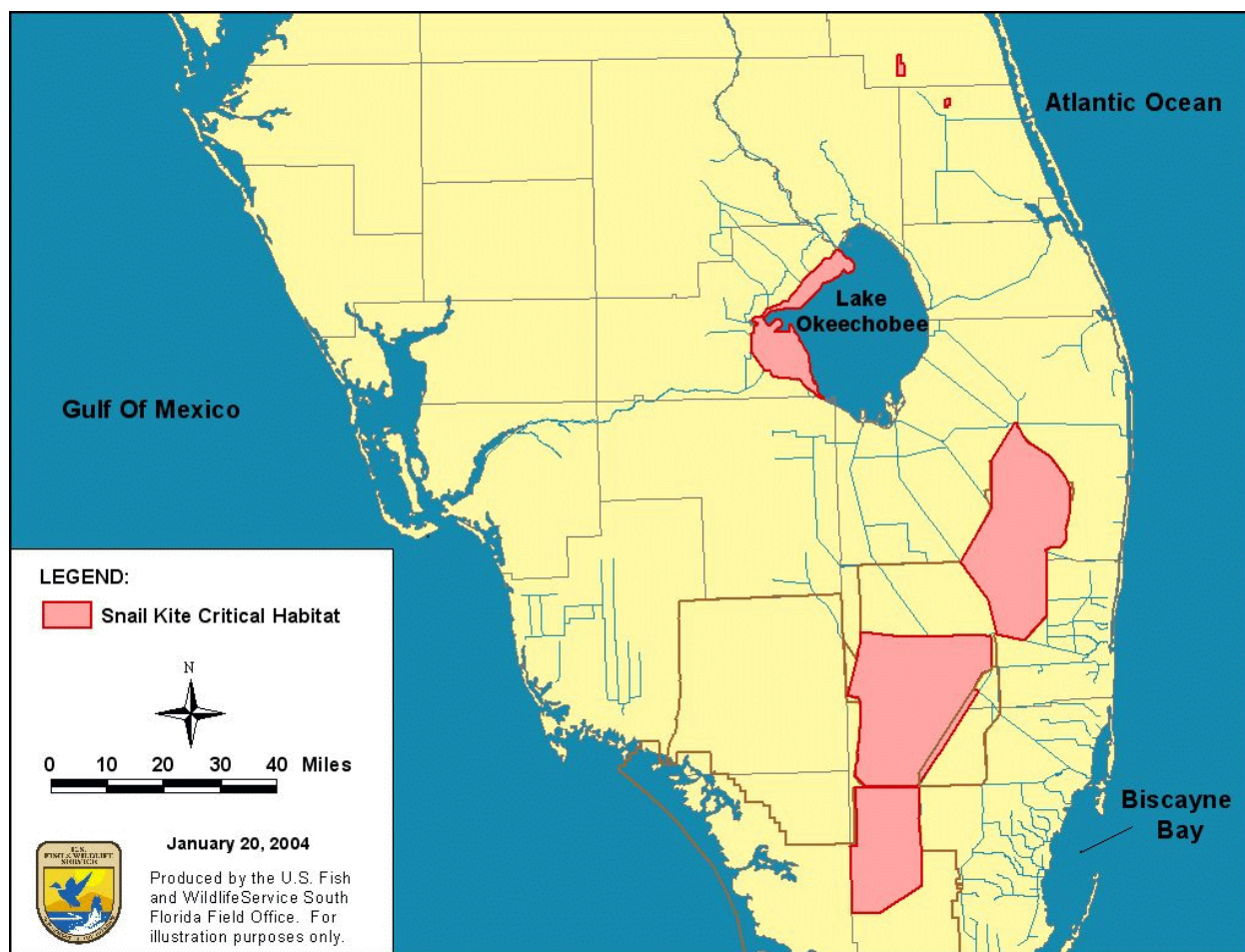


Figure 12. Location of designated Everglade snail kite critical habitat.

Everglade snail kite

A 1,500-foot buffer for construction activity near nesting snail kites was established and impacts within the buffer were considered an adverse effect. We assumed that construction disturbance outside the buffer does not adversely affect foraging kites. A six-foot strip of suitable foraging habitat was calculated for the perimeter of new reservoirs if perches would be available. Shorelines of in-ground reservoirs were not included in this unless littoral shelves were part of the design. Although STAs may be used by kites on occasion, they are not expected to provide reliable habitat and were not considered suitable.

Short hydroperiod wetlands (those that dry down in most years) were not considered kite habitat unless they were part of a lake littoral zone. The same long hydroperiod habitat could be counted as both wood stork and snail kite habitat.

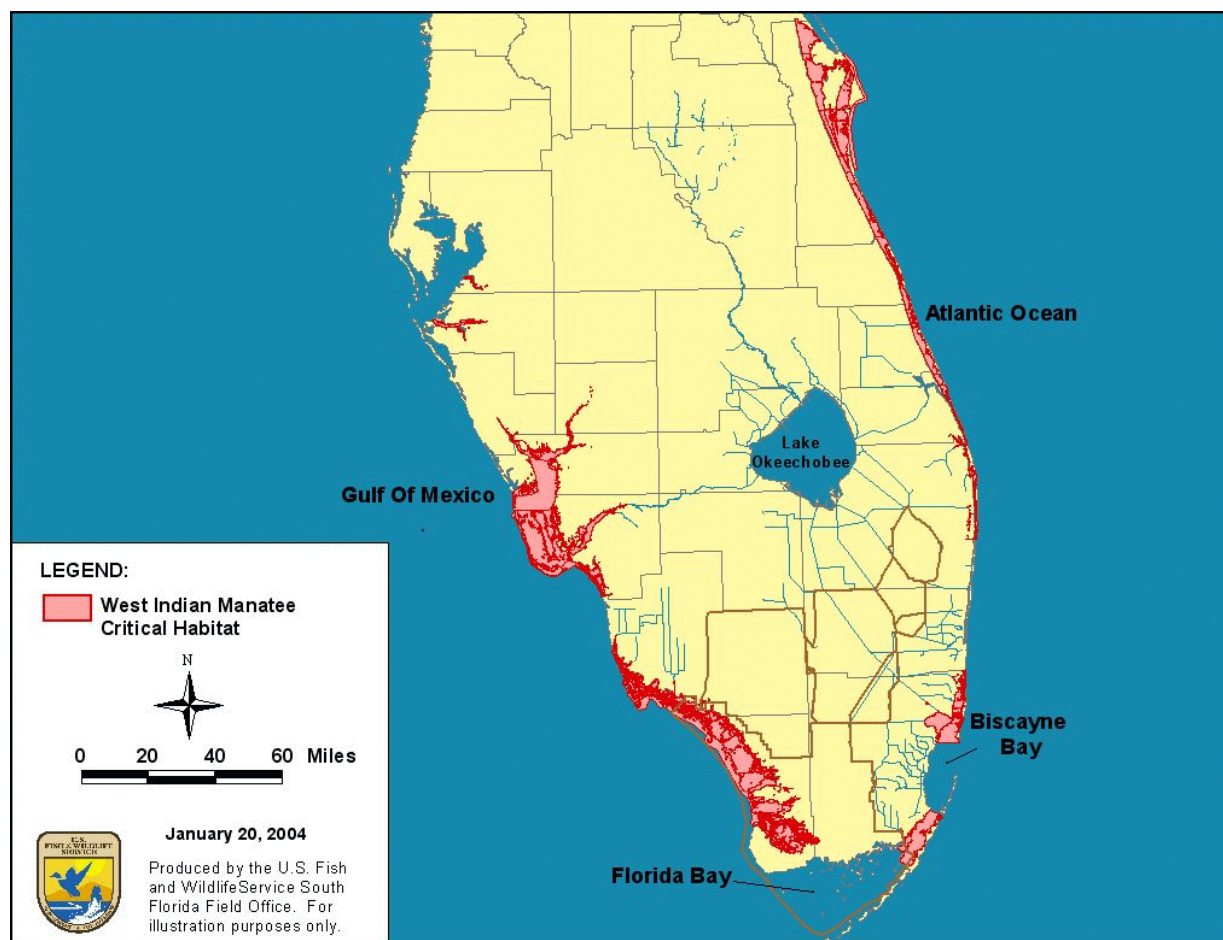


Figure 13. Location of designated West Indian manatee critical habitat.

Bald eagle

In accordance with the Service's *Habitat Management Guidelines for the Bald Eagle in the Southeast Region*, we established a 700-foot Primary Zone and a 1,500-foot Secondary Zone around known nesting trees. Habitat loss or disturbance within these zones was considered a potential adverse effect. Loss of foraging habitat outside nest zones was not considered an adverse effect because the best available science indicates that foraging habitat is not a limiting factor for bald eagles. Foraging habitat gains were considered beneficial effects. Primary canals (with a Corps "C" or "L" number) and similar new canals were considered potential foraging habitat as were new reservoirs if suitable perches would be included within and/or adjacent to them. In-ground reservoirs were not considered foraging habitat since the vertical sides and very deep depths provide no significant habitat for fish. STAs were considered foraging habitat only if they were planned with an open water (no emergent vegetation) component and suitable perches would be available.

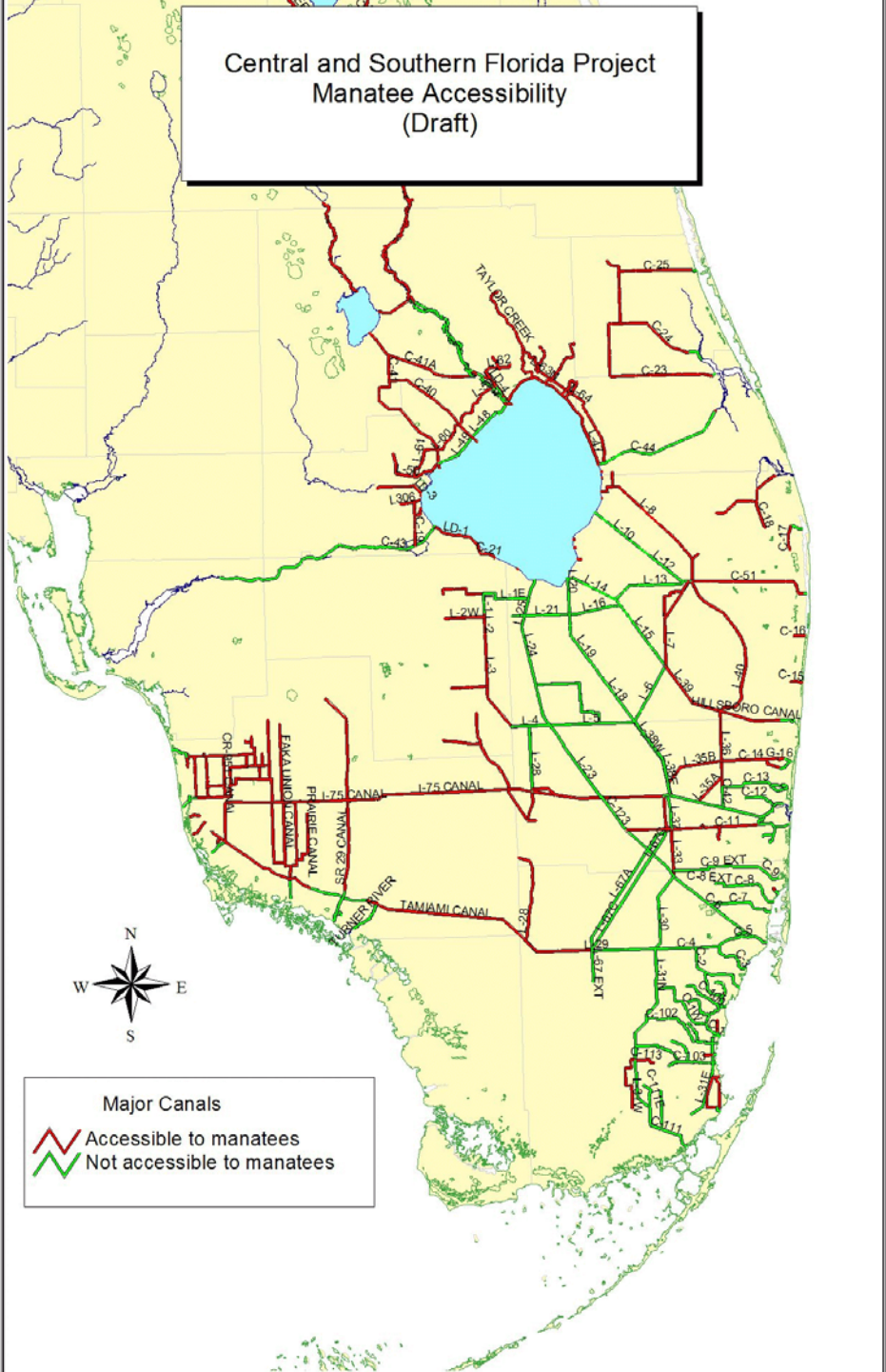


Figure 14. Central and Southern Florida Project Manatee Accessibility (Draft) map developed by the Comprehensive Everglades Restoration Plan (CERP) Interagency Manatee Task Force.

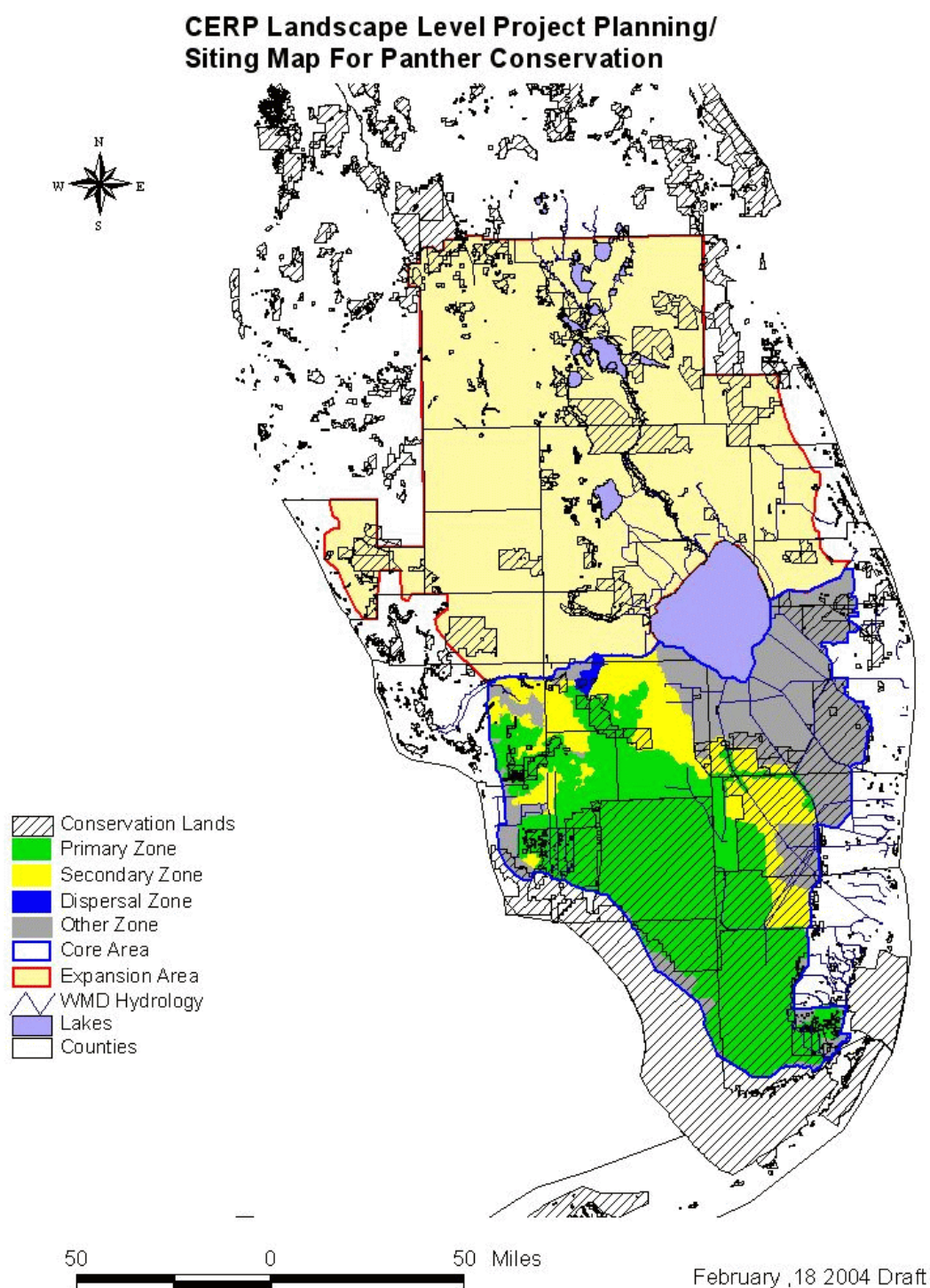


Figure 15. Comprehensive Everglades Restoration Plan Landscape Level Project Planning/Siting Map for Panther Conservation.

We determined that sufficient science does not exist to support a claim of benefits to bald eagles due to increased prey in estuaries resulting from CERP projects or due to water quality improvements. Removal of upland exotics was not assumed to be a benefit. Removal of aquatic exotic plants could be beneficial in suitable water bodies with follow up management.

Eastern indigo snake

All levees and berms were considered suitable habitat including levees with rip-rap since this treatment provides suitable cover. Possible road mortality associated with roadways on top of levees was noted separately. Road degradation in wetland areas was considered a loss of habitat with reduced road mortality issues considered separately. Habitat improvements near roads were not considered to cause a greater likelihood of road mortality.

Since the science on snakes indicates that indigo snakes regularly use wetlands when tree islands or other uplands are interspersed, we treated new STAs as indigo snake habitat when uplands would be interspersed. We assumed (unless we had project specific information to the contrary) that all new STAs will include multiple compartments formed by levees that provide interspersed uplands. We also assumed that initial inundation of STAs and reservoirs and inundation after long dry periods would be unlikely to cause direct mortality. Littoral shelves were not considered habitat when they were designed as wading bird habitat unless they are designed with interspersed uplands and exotic plant removal was not be counted as a benefit.

Florida panther

We considered footprint effects of the CERP within the areas defined by the *Comprehensive Everglades Restoration Plan Landscape Level Project Planning/Siting Map for Panther Conservation* (Figure XX). This map was developed by the Service based on the *Landscape Conservation Strategy for the Florida Panther in South Florida* (Service 2002), prepared by the Florida Panther Subteam of the Multi-species/Ecosystem Recovery Implementation Team for South Florida. The Primary and Dispersal Zones have first priority for implementation of conservation actions and for avoidance and minimization of adverse effects, followed by the Secondary Zone, Other Zone and Expansion Area. Improved conditions within the Conservation Lands area is also considered beneficial. Within these areas, we developed high, medium, low and zero rankings by FLUCCS code to characterize the relative quality of each land cover type as panther habitat (Table M-3). These rankings were also based on Service (2002). Reservoirs were considered low quality, STAs and levees were considered medium quality, and canals were considered to have no panther habitat value.

Each biologist compared the project siting information they had gathered with Figure 15 and calculated the number of acres that coincided with each zone or area. The Primary and Dispersal Zones were combined into one category for this analysis because they are both first priority for protection. FLUCCS codes and Table M-3 were then used to calculate the number of high, medium, low and zero quality acres for both the pre-project and with-project condition within each zone or area. Impacts were considered beneficial when the with-project condition resulted

in more acres of high quality cover types than did the pre-project condition. An opposite trend indicated an adverse impact.

Florida scrub-jay

Rehydration to natural water levels of areas including some scrub-jay habitat was not considered adverse when the scrub was expected to remain.

Wood stork

In accordance with the Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area*, we established nesting colony buffer zones and an 18.6-mile core foraging area (CFA) around known nesting colonies. Construction disturbance to foraging storks outside the colony zones was not considered an adverse effect. Loss of foraging habitat within the colony zones or 18.6 mile Core Foraging Areas was considered a direct adverse effect.

Surface and in-ground reservoir edges were not considered foraging habitat unless littoral shelves specifically designed to concentrate fish were included. Likewise, edges of levees and deep canals where fish would not be concentrated were not considered habitat. Although STAs may be used by storks on occasion, they are not expected to provide reliable habitat and were not considered suitable habitat.

We assumed two percent of a typical citrus grove (with poorly drained soils) and zero percent of citrus groves on highly-drained soils would be available to wood storks for foraging. Wetlands with melaleuca were only considered habitat when they had less than 50 percent melaleuca cover. Exotic plant removal was considered a habitat gain if done with a followup maintenance plan.

The same long hydroperiod (does not dry down in most years) habitat could be counted as both wood stork and snail kite habitat because long-hydroperiod areas can provide valuable stork foraging habitat in years with suitable dry season water recession rates.

Results

Results of the exposure and response analyses that could be expressed in acres were tallied in Table S-1 for federally designated critical habitats and listed species, Table S-2 for the Florida panther, and Table S-4 for MSRP ecological communities (see Summary for these tables). It is important to keep in mind that not all potential effects are included in these tables. Effects such as construction disturbance, increased or decreased risk of vehicle collisions or improved habitat connectivity could not be expressed in acres and so are not included. Readers interested in all potential effects of a project should read the entire project analysis.

Project Descriptions and Initial Evaluations of Effects

01, 02 Lake Okeechobee Watershed and Lake Istokpoga Regulation Schedule

The Lake Okeechobee Watershed project description

The Lake Okeechobee Watershed Project (LOWP) is located in Okeechobee, Highlands and Glades County, Florida and was designed as one of the northernmost components of the CERP. Years of excessive phosphorus inputs into Lake Okeechobee, from anthropogenic sources upstream, have contributed to the eutrophication of the lake and a decrease in the water quality that flows to coastal estuaries from the lake. In addition, the unnatural timing, duration, and magnitude of high and low water levels have caused damage to the flora and fauna in the lake's littoral zone. In light of these ecosystem stressors, the primary purposes of the LOWP are water storage and phosphorus retention. Four separable elements were designed to achieve the primary project purposes and include: (1) North of Lake Okeechobee Storage Reservoir; (2) Taylor Creek/Nubbin Slough Storage and Treatment Area; (3) Lake Okeechobee Watershed Water Quality Treatment Facilities; and (4) Lake Okeechobee Tributary Sediment Dredging.

Construction and operation of the LOWP's four separable elements is expected to result in significant ecological benefits to Lake Okeechobee and contribute to the restoration, preservation, and protection of the south Florida ecosystem. However, construction of the four separable elements will require the conversion of a significant amount of the project area's 914,428 acres to water storage and water quality treatment facilities (Table 01-1). The primary purpose of the LOWP's facilities is to meet the project objectives for the benefit of Lake Okeechobee, *i.e.*, they are not, within themselves, intended to provide or restore habitat for native flora and fauna within the watershed, or necessarily to improve fish and wildlife habitat within the watershed. However, the Restudy proposed that 3,500 acres of wetlands be restored as part of the LOWP. While wetland restoration was proposed as a partial solution for water quality and storage problems, if performed appropriately, wetlands restoration may provide habitat for threatened and endangered species.

The locations, exact sizes, and types of above-ground storage reservoirs and water quality treatment facilities have yet to be determined. If treatment wetlands are constructed, as proposed in the C&SF Restudy, then they are likely to have a maximum depth of approximately 4 feet. Water levels in above-ground storage reservoirs are likely to be highly variable and may fluctuate from 0-10 feet.

Table 01-1. Area of impact in acres, miles², and percent of project area for each Lake Okeechobee Watershed Project separable element.

Separable Project Element	Area of Impact		
	acres	miles ²	percent of project area
North of Lake Storage Reservoir	20,000	31.25	2.19
Taylor Creek/Nubbin Slough Storage and Treatment Area	10,000	15.63	1.09
Lake Okeechobee Water Quality Treatment Facilities	4,375	6.84	0.48
Lake Okeechobee Tributary Sediment Dredging	N/A	N/A	N/A
Total	34, 375	53.72	3.76

Based on recent discussions with project managers, the Lake Okeechobee Tributary Sediment Dredging separable element is likely to be dropped from the project. Therefore, we have assumed for this report that there will be no dredging.

The Lake Istokpoga Regulation Schedule project description

Lake Istokpoga is an approximately 43 square mile lake located in Highlands County, Florida. This project has been identified as a lake regulation schedule evaluation study with the purpose of enhancing fish and wildlife and developing a long-term comprehensive management plan for Lake Istokpoga.

The Service reviewed the Draft Project Management Plan (PMP) and attended two Project Delivery Team (PDT) meetings for the Istokpoga CERP project, and we offered suggestions for this project. We have also read the Draft White Paper entitled *Comprehensive Everglades Restoration Plan Expediting Small CERP Projects*. In the Draft White Paper, the Lake Istokpoga Regulation Schedule project is identified as a small CERP project because its overall estimated cost is less than \$25 million, or because the action area is hydrologically isolated from the regional system, or because the project may not be expected to have system-wide impacts that can be evaluated using the regional evaluation tool.

The Service and others expressed concern that the current project had little chance of succeeding due to pre-existing societal constraints (Service 2002b). In light of the Service's recommendations, it appears that the Lake Istokpoga area will be incorporated into the LOWP study area.

Effects analyses for the Lake Okeechobee Watershed project

Twelve federally listed animal species are known to exist or potentially exist in the LOWP study area (Table M-1). They include the endangered West Indian manatee, wood stork, red-cockaded woodpecker, Everglade snail kite, Florida panther, Florida grasshopper sparrow, Florida scrub-jay, and the threatened Audubon's crested caracara, bald eagle, eastern indigo snake, bluetail mole skink, and sand skink. An additional endangered species, the whooping crane, may also be present in the study area. These individuals were released as a non-essential experimental population, and, therefore, are not subject to the consultation requirement of section 7(a)(2) of the ESA. We will provide future recommendations concerning the conservation of this population under the authority of Section 7(a)(1) of the ESA and the FWCA.

Additionally, critical habitat for the snail kite (see 50 CFR 17.95) is present immediately adjacent to the study area along the western edge of Lake Okeechobee from the S-310 structure near the town of Clewiston to the point of confluence of the Kissimmee River with Lake Okeechobee. This critical habitat is located within Lake Okeechobee and outside of the current project's study area.

Seventeen federally listed plant species are known to exist or potentially exist in the study area; however, most of these species (except the Okeechobee gourd) are scrub inhabitants, and, therefore, are potentially present mainly on the periphery of the study area. If the project area is increased to include the watershed north of Lake Istokpoga, then the likelihood of affecting these species increases. These listed plants include the endangered Okeechobee gourd, Florida perforate cladonia, scrub mint, snakeroot, highlands scrub hypericum, scrub blazing star, Britton's beargrass, wireweed, sandlace, scrub plum, Carter's mustard, Florida ziziphus, and Lewton's polygala, and the threatened Florida bonamia, pigeon wings, scrub buckwheat, and papery whitlow-wort. If the study area was enlarged to include the area north of Lake Istokpoga, we would then add the endangered Garrett's mint.

Methods

At the current time, no alternative locations have been identified for placement of the LOWP's storage reservoirs and treatment wetlands. The project's footprint is likely to encompass approximately 4 percent (35,000 acres) of the project area (914,000 acres). This area estimate includes new water control structures and connecting canals. We used the FLUCCS codes that constitute fish and wildlife habitat in the LOWP project area to perform a potential effects analysis for threatened and endangered species. Two alternative siting scenarios were used: (1) siting the project randomly with a footprint that represented the relative frequency of all available habitats (FLUCCS 111-745) (Fig. 01-1) and (2) siting the project in agricultural lands only (FLUCCS 211-223) (Fig. 01-2). Scenario 1 essentially considers all potential habitat for fish and wildlife throughout the project area. Scenario 2 was included because it was deemed reasonably likely to occur considering: (1) the Service has constructed a GIS-based tool to assist the Corps in minimizing ecological impacts that currently guides the project planners to choose

these areas; (2) project features are likely to be sited on agricultural lands near Lake Okeechobee, where it is practicable to store water for the lake from watershed runoff and back-pumping from the lake; (3) the Corps is likely to encounter real estate, owned by willing sellers, on agricultural lands, such as improved and unimproved pasture; and (4) improved and unimproved pasture comprise over 40 percent of the project area.

Adverse effects of the Lake Okeechobee Watershed project

For Scenario 1, we calculated the proportion of each habitat relative to the total 909,290 acres of all potential fish and wildlife habitat in the project area and then multiplied that by the project footprint. To analyze potential effects for Scenario 2, we calculated the frequency of each agricultural FLUCCS code, relative to the total area of the agricultural FLUCCS codes and multiplied that frequency by the area of the project footprint.

To calculate a baseline total acres for each species, the acres for all applicable FLUCCS codes was tallied. The same calculations were performed for Scenarios 1 and 2 and the percentage of baseline lost was calculated (Table 01-2). For the Florida panther, we calculated the potential loss and gain of high, medium, and low quality habitats within the Expansion Zone. All Florida panther habitats were within the Expansion Area (Fig. 15). This analysis was performed for all listed species occurring within the project footprint (Table M-1). However, the analysis for the LOWP differed from this document's standard protocols in several ways as a result of the very large project area and unknown project site locations. For the snail kite, we tallied all listed FLUCCS acres and did not differentiate between short and long hydroperiod wetlands. In the Okeechobee Watershed, many bald eagle nests are located in areas not within 3 km of open water and forested areas. Therefore, for our analysis we considered all listed habitats as potential bald eagle nesting areas. Grasshopper sparrow habitat and caracara habitats were tallied from all FLUCCS codes identified as potential habitat. For those two species, given the large project area and inability to specifically analyze the presence of wooded areas and trees, we were unable to perform a more detailed habitat suitability analysis. A detailed analysis should be conducted when locations of project features are known.

Additionally, the West Indian manatee could be affected during construction and operation of intake and outfall structures connecting LOWP features to Lake Okeechobee. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during construction in areas accessible to manatees. Installation and operation of manatee exclusion devices at the pump stations should minimize the possibility of take during structure operation. A multi-agency team is developing additional guidance for structure design and manatee access.

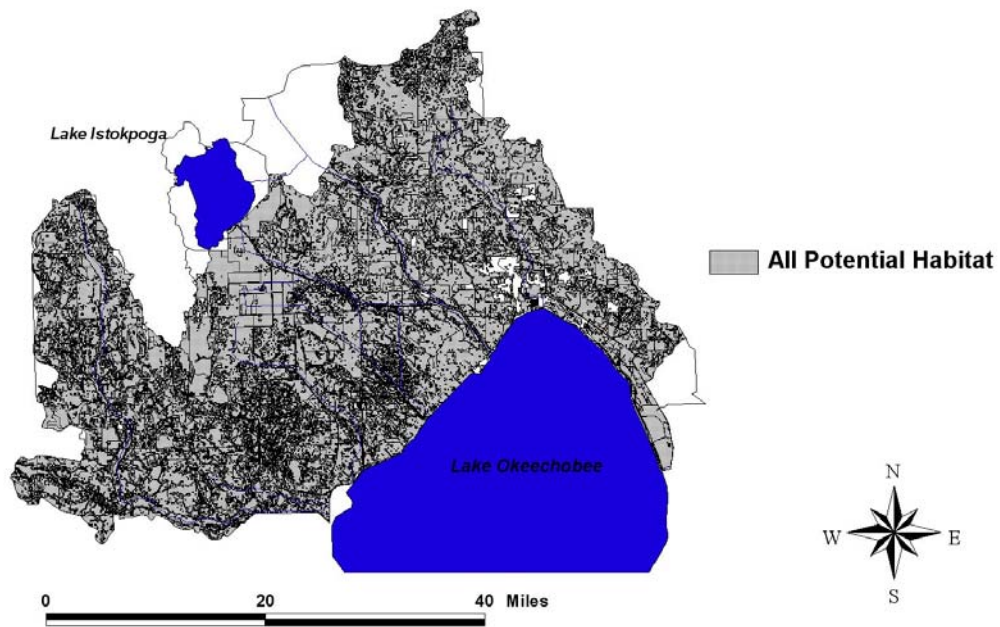
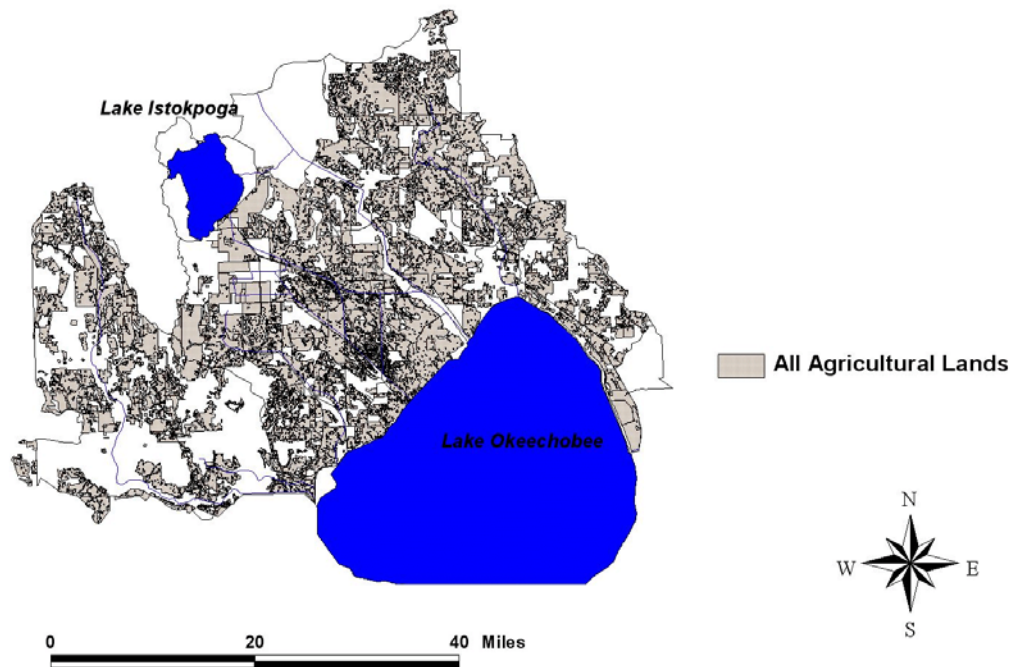


Figure 01-1. All potential habitat in the Lake Okeechobee Watershed Project area (Scenario 1).
Figure 01-2. Agricultural land within the Lake Okeechobee Watershed Project area (Scenario



2).

Bald eagles may be harmed through electrocution when perching on electrical lines. For new electrical lines near open water that may need to be installed for this project, the publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

Table 01-2. Baseline habitat in the Lake Okeechobee Watershed Project study area, estimated habitat effects, and percent loss of baseline, for two project siting scenarios; (1) siting in any of the available habitats in the study area and (2) siting in agricultural lands. Potential benefits from proposed wetlands restoration are also noted.

Species	<i>All Habitats Scenario (1)</i>			<i>Agricultural Lands Scenario (2)</i>		
	Baseline Habitat (acres)	Impacted Habitat (acres)	Percent Loss	Impacted Habitat (acres)	Percent Loss	Potential Benefits (acres)
Caracara	764,617	29,415	3.9	34,371	4.5	0
Grasshopper Sparrow	521,729	20,071	3.9	29,862	5.7	0
Red-cockaded Woodpecker	112,171	4,315	3.9	8,425	7.5	0
Snail Kite	152,357	5,862	3.9		0.0	3,531
Scrub-jay	597,024	22,967	3.9	32,579	5.5	0
Wood Stork (indirect)	666,978	23,293	3.5	34,371	5.2	3,656
Indigo Snake	898,075	33,666	3.8	41,208	4.6	13,657
Manatee	0	0	0.0	0	0.0	0
Panther Expansion Zone - High	245,058	9,428	3.9	0	0.0	3,500
Panther Expansion Zone - Medium	488,083	18,777	3.9	29,115	7.0	0
Panther Expansion Zone - Low	130,899	5,036	3.9	5,885	4.5	0
Bald Eagle	67,418	23,012	35	29,114	43	3,500
Okeechobee Gourd	74,634	1,243	1.7	0	0.0	3,500
Scrub Plants	5,828	230	4.0	0	0.0	0

Beneficial effects of the Lake Okeechobee Watershed project

The LOWP proposes to restore at least 3,500 acres of wetland habitat. The classification of this wetland habitat has yet to be determined. However, wetland restoration may provide habitat for any wetland-dependent species. Potential benefits of up to 3,500 acres of habitat are noted for several species in Table 01-2. While the LOWP is likely to construct approximately 35,000 acres of reservoir and treatment wetlands, the Service has no information on the design, maintenance, and operation of these facilities. The primary purpose of the facilities is to store water and remove phosphorus from Lake Okeechobee tributaries. The design, operation, and maintenance of reservoirs and treatment wetlands may consider habitat for threatened and endangered species; however, these details are not yet available and uncertainty regarding potential habitat values of these features is high. Based on our current understanding of reservoirs and treatment wetland areas as potential habitat, the perimeter of the reservoirs and STAs should provide some snail kite habitat. Using the C&SF Restudy descriptions and a 6 foot width for the suitable habitat, we calculated a total of 31.34 acres of snail kite habitat created. Using a 30 feet assumed bottom width for levees, we calculated a total 156.65 acres of new levees and up to 10,000 acres of STAs that may provide eastern indigo snake habitat. Moreover, when formulating for alternatives plans, the Corps will likely include other water storage and water quality treatment technologies. Alternatives for water storage may include aquifer storage and recovery or storage in restored wetlands. Water quality treatment alternatives may include chemical treatment, advanced aquatic plant-based technologies, or treatment through wetland restoration projects. Thus, uncertainty is high, so benefits analysis will need to be adjusted as the project proceeds.

Effects analyses for the Lake Istokpoga Regulation Schedule project

The project, as currently described, is nonstructural, and only has the potential to affect the littoral zone of Lake Istokpoga. The perimeter of the lake is 33.1 miles and we assumed a 300 feet littoral width which would result in 1,204 acres of littoral habitat. Within the littoral zone and shoreward, the lake supports wood storks and snail kites. Therefore, any modification to the existing lake regulation schedule has the potential to affect wood storks and snail kite habitat.

If coordinated with the LOWP, this project is likely to be implemented and result in benefits for snail kites and wood storks in Lake Istokpoga by restoring littoral zone habitat. The benefits would be habitat improvements to the entire littoral zone, because the implementation of a water regulation schedule would improve foraging habitat for both species. The degree of improvement is difficult to estimate but could be as much as an 80 percent (963 acre) increase in usable habitat. Further evaluations will occur when the project objectives are more clearly defined, or when the project is merged with the LOWP.

Conclusions

The Service has estimated potential habitat losses and gains as a result of the LOWP for 10 animal species, the Okeechobee gourd, and several scrub-dependent plant species. Harm to several threatened and endangered species is likely to occur by way of habitat conversion. Our analysis only provides estimates of potential habitat loss. Thus, the level of uncertainty presented here is large and actual losses and gains will depend on the locations used for siting project features, technologies used to achieve project goals, and the degree to which wetland restoration projects are incorporated into the preferred alternative. Our evaluation of potential effects to threatened and endangered species was performed using two scenarios. It is not likely that the Corps will randomly place project features (Scenario 1). Realistically, the Corps will work with our ongoing recommendations to use agricultural lands (Scenario 2). In that case, effects to habitat will be avoided or minimized for many species. However, effects to the existing area of habitat for grassland-dependent species, such as the caracara and grasshopper sparrow, will likely increase. The Corps should review the following Service documents and implement all protection measures as project planning for the LOWP progresses:

- a. *Habitat Management Guidelines for the Wood Stork in the Southeast Region.*
- b. *Supplemental Habitat Management Guidelines for the Wood Stork in the South Florida Ecological Services Consultation Area.*
- c. *Standard Protection Measures for the Eastern Indigo Snake.*
- d. *Habitat Management Guidelines for the Bald Eagle in the Southeast Region.*
- e. *Habitat Management Guidelines for Audubon's Crested Caracara in Central and Southern Florida.*
- f. *Florida Grasshopper Sparrow Conservation Guidelines.*
- g. *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996.*
- h. *Standard Manatee Protection Construction Conditions for Aquatic-related Activities*

Consultation History

May 29, 2002 - The Service sent a letter to the Corps that listed threatened and endangered species that are likely to occur in the LOWP study area. This letter was in response to Corps engineer, Stuart McLean's oral request for a list of these species at a LOWP PDT meeting.

Lake Okeechobee ASR Project Description

The ultimate full-scale design of the Lake Okeechobee ASR system will be based on the ASR pilot projects and includes a series of ASR wells adjacent to Lake Okeechobee with a total capacity of 1 billion gallons per day and associated pre- and post- water quality treatment in Glades and Okeechobee Counties. The initial design assumes 200 wells, each with the capacity of 5 million gallons per day (mgd) with 8 ultra filtration water quality pre-treatment facilities (including an intake pump station per treatment facility) and aeration for post-treatment (Fig. 03-1). Generally, the well footprints take up very little space. Wells and associated infrastructure, including treatment plants for this project, will occupy approximately 100 acres. Based on information from existing ASR facilities studied, it is assumed that recovery of aquifer-stored water would have no adverse effects on water quality conditions in Lake Okeechobee. In fact, some level of nutrient load reduction may occur as a result of aquifer storage, which would be a long-term benefit to in-lake water quality conditions. The level and extent of treatment and number of the ASR wells may be modified based on findings from the Lake Okeechobee Aquifer Storage and Recovery Pilot Project. The pilot project will also investigate changes to water chemistry resulting from aquifer storage and identify post-retrieval water quality treatment requirements, if any, necessary to implement aquifer storage and recovery facilities. The Comprehensive Plan includes additional pilot studies to investigate the feasibility of the ASR facilities, including associated water quality changes.

The purpose of this project is to: (1) provide additional regional water storage while reducing both evaporation losses and the amount of land removed from current land use (e.g., agriculture) that would normally be associated with construction and operation of above-ground storage reservoirs; (2) increase the lake's water storage capability to better meet regional water supply demands for agriculture, Lower East Coast urban areas and the Everglades; (3) manage a portion of regulatory releases from the lake primarily to improve Everglades hydropatterns and to meet supplemental water supply demands of the Lower East Coast; (4) reduce harmful regulatory discharges to the St. Lucie and Caloosahatchee Estuaries and (5) maintain and enhance the existing level of flood protection.

The operation of this project assumes that after treatment, water from Lake Okeechobee will be injected into the upper Floridan Aquifer System when the climate-based inflow model forecasts that the lake's water level will rise significantly above those levels that are desirable for the lake littoral zone. During the dry season, water stored in the Floridan Aquifer will be returned to the lake either when the lake water level is projected to fall to within three quarters of a foot of the supply-side management line or below an established water level during the dry season.

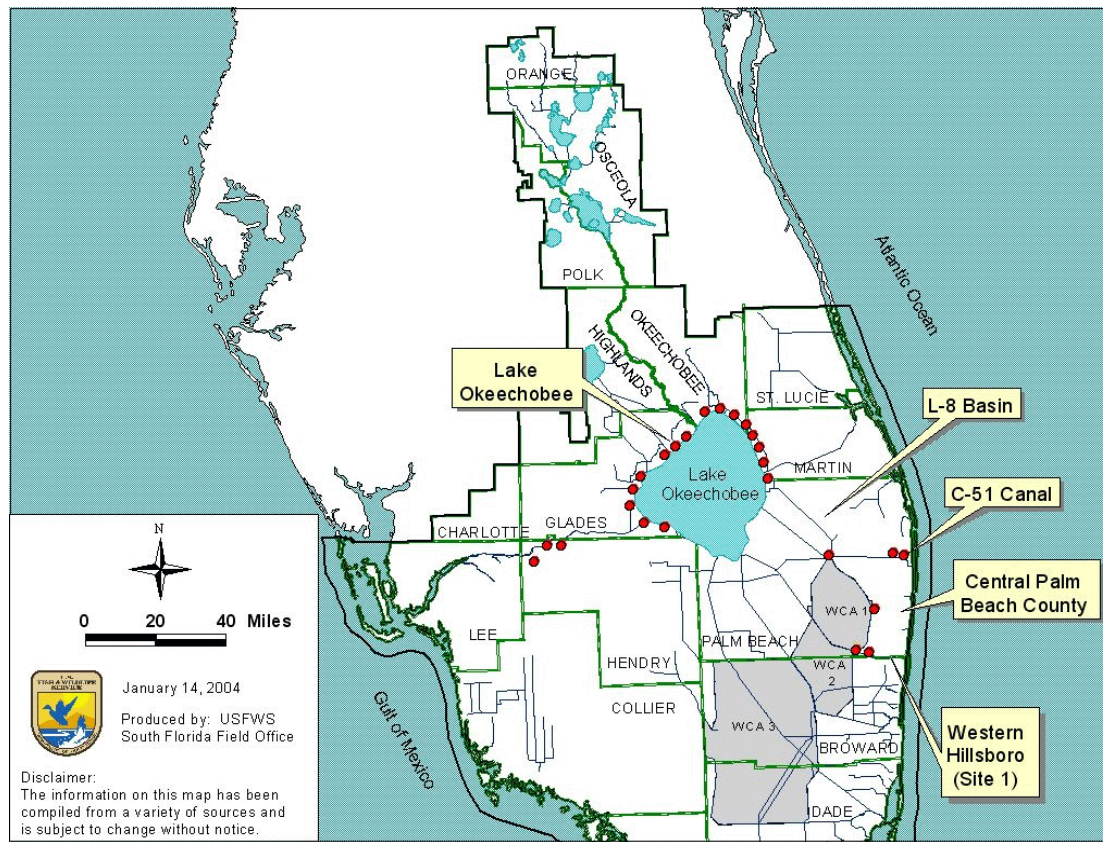


Figure 03-1. Regional Aquifer Storage and Recovery well general locations.

Effects analyses for the Lake Okeechobee ASR project

The installation/operation of the 200 Lake Okeechobee ASR wells has the potential to adversely affect the following federally listed species: West Indian manatee, wood stork, bald eagle, Audubon's crested caracara, eastern indigo snake, Everglade snail kite, and Okeechobee gourd.

West Indian manatee

West Indian manatees are known to occur in the lake, Kissimmee River, C-44, and C-43. According to the Service's database, from 1976 to 2000 there have been 102 recorded manatee mortalities in and around the lake. Whereas the scope of construction for the pilot project was limited (a very small footprint), the full scale implementation of the Lake Okeechobee ASR is much larger and the resulting potential effects to manatees are concurrently larger as well. There is a chance that manatees might be encountered during construction of the intake pump stations (including potential offloading of equipment from barges, for example). Construction-related effects to this species should be minimized by implementation of the Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* including the

presence of a manatee observer. If manatees are observed during construction, the Service should be notified and a determination of the severity of the effect would be needed. If the effect is determined to be adverse, then reinitiation of consultation may be necessary.

The operation of intake pumps may affect manatees through trapping and crushing. However, the installation and operation of manatee exclusion devices at the pump stations should minimize the possibility of take during pump operation. A multi-agency team is developing additional guidance for structure design and manatee access.

The subsequent discharge of ASR water following recovery could also adversely affect manatees. At this time, the maximum amount of discharge from any one of the pilot wells is 5 mgd. The full-scale implementation is currently designed to provide one billion gallons of water per day. At this rate, it is likely that this discharge would not be diluted and could pose a threat to manatees if the water quality was poor. However, the Florida Department of Environmental Protection (DEP) will provide discharge criteria for all ASR effluents for the protection of fish and other aquatic life. For the purposes of this report, we will assume that these discharge criteria will eliminate any adverse effects due to water quality. There is also the possibility of thermal effects within the discharge plume – the water is likely to be colder than the ambient surface water. The temperature differential will depend on the residence time following recovery and prior to discharge, and the volume of the discharge. Since manatees are susceptible to water temperatures less than 68 degrees Fahrenheit, the Service will need to work with the DEP to set an appropriate minimum temperature discharge requirement. This concern should be addressed for all ASR wells. At this time, it is difficult to estimate the size of the discharge plume and the resulting thermal changes due to site specific characteristics (this will be different for all ASR discharges). The manatee population in the Okeechobee area is not as large as that along the coasts, so the potential effects to those individuals may not be as significant as an ASR installed near the coast. An analysis of the anticipated discharge timing (presumably during droughts and the dry season) and the seasonal occurrence of manatees in the project area would facilitate determination of effect. Presently, aerial surveys for manatees do not include the lake. Additional manatee abundance data from the lake may need to be collected to estimate this type of effect.

Wood stork

According to the Service's database, there is one wood stork colony 17.7 miles from the Kissimmee River Pilot Project Site. This is just within the wood stork CFA of 18.6 miles. It is located in St Lucie County on the Cypress Creek Parcel. Full-scale implementation would include additional wells north of the lake that would also be within this CFA. Well construction will be in upland areas and therefore, would likely have a minimal effect, if any, on foraging or loafing storks. Wood storks were observed along a canal near the Kissimmee River site during a recent site inspection (February 2003). Given the distribution of this species, it is likely that wood storks may be encountered at any new well site.

The construction of influent pump stations and discharge structures will probably occur adjacent to water bodies and therefore may effect nesting, foraging, or loafing storks. However, at this time we do not know the locations of the influent pumps or discharge structures so we cannot ascribe a certain level of effects to storks. A possible worst case scenario would be to predict a loss of 16 acres of shoreline habitat (this assumes two acres of wetland impact for each of the 8 treatment plant's influent pumps and discharge structures).

Therefore, the following guidelines would apply. Based on the Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region*, to the maximum extent possible, feeding sites should be protected by adherence to the following habitat management protection zones and guidelines:

- a. There should be no human intrusion into feeding sites when storks are present. Depending upon the amount of screening vegetation, human activity should be no closer than between 300 feet (where solid vegetation screens exist) and 750 feet (no vegetation screen).
- b. Feeding sites should not be subjected to water management practices that alter traditional water levels or the seasonally normal drying patterns and rates. Sharp rises in water levels are especially disruptive to feeding storks.
- c. The introduction of contaminants, fertilizers, or herbicides into wetlands that contain stork feeding sites should be avoided; especially those compounds that could adversely alter the diversity and numbers of native fishes, or that could ly change the characteristics of aquatic vegetation. Increase in the density and height of emergent vegetation can degrade or destroy sites as feeding habitat.
- d. Construction of tall towers (especially with guy wires) within three miles, or high power lines (especially across long stretches of open country) within one mile of major feeding sites should be avoided.

Bald eagle

According to the Service's database, there are 27 bald eagle nests within 19,800 feet of the Lake Okeechobee shoreline. However, there is only one nest close enough to the lake to be within either 700 feet (Primary Zone) or 1,500 feet (Secondary Zone) of an ASR well. It is located at Big Bear Beach approximately four miles southwest of the confluence of Indian Prairie Canal with the lake. However, at this time we do not know the exact locations of the ASR wells beyond the three pilot project wells. Therefore, when site selection occurs, we would recommend avoiding this area, or at least avoiding the Primary and Secondary Zones around the nest. For purposes of this report, we have assumed that the Primary and Secondary Zones will be avoided. If construction were to occur within 1,500 feet of an eagle nest, the Service's

Habitat Management Guidelines for the Bald Eagle in the Southeast Region should be consulted during project planning.

In the future, bald eagles could be encountered during construction. During a recent site visit to the Port Mayaca Pilot Project site, Service biologists observed a bald eagle flying over the C-44 towards Lake Okeechobee adjacent to the proposed well area. After catching a fish from the canal, the eagle flew off in an east-northeast direction. The Service has no specific guidelines to minimize take of a foraging eagle. However, project managers and construction crews should be aware of the potential presence of eagles and the potential for disturbing a foraging or roosting eagle. A recommendation would be to monitor the site during construction activities for bald eagles. If observed, the Service should be alerted and a determination would be made as to the severity of the effects. If determined to be an adverse effect, consultation would be reinitiated, if appropriate.

Also, there is the possibility that new electrical lines will need to be installed near open water to service new pumps. The publication, *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

Audubon's crested caracara

Lake Okeechobee is in the center of the caracara's distribution. According to the Service's database, numerous observations and nests occur north and west of the lake. Forty-three nests have been recorded within 19,800 feet of the shoreline. Eleven nests are within 6,600 feet (Secondary Zone) of the lake. No nests are within 985 feet (Primary Zone) of the lake. The potential for take of caracara nest or roost trees or harassment of nesting caracaras, nestlings, or fledglings is possible for full-scale implementation of the Lake Okeechobee ASR Project. At this time, we do not believe that much foraging habitat would be lost. Generally, the well footprints take up very little space. Wells and associated infrastructure, including treatment plants for this project will occupy approximately 100 acres. A maximum possible number of nests that might be disturbed would be the 11 nests currently within 6,600 feet of the lake. Therefore, the worst-case scenario would be the total loss of 100 acres of foraging habitat within the Secondary Zones of all 11 nests combined. At this time, it is not possible to predict the percentage of each Secondary Zone that would be lost per ASR facility because we do not know the exact locations of the wells and treatment facilities. We do not anticipate any effects to caracara juvenile congregation areas from this project. This does not incorporate new or unknown nests or congregation areas that may be discovered prior to start of construction. After site selection of potential wells, consultation will need to be reinitiated to determine the effects to caracara reproduction.

Foraging and/or roosting caracaras are likely to be encountered during construction of this project. The Service has no specific guidelines to reduce take of foraging caracaras outside of the nesting zones; however, project managers and construction crews should be aware of their

potential presence and the potential for disturbing a foraging or roosting caracara. A recommendation would be to monitor the site during construction activities for caracaras. If observed, the Service should be alerted and a determination would be made as to the severity of the effects. If determined to be an adverse effect, consultation would be reinitiated, if appropriate. To reduce potential effects to caracaras during construction, for new or as yet undiscovered nests, the Service's *Habitat Management Guidelines For Audubon's Crested Caracara In Central and Southern Florida* should be consulted during project planning.

Eastern indigo snake

There is a potential for eastern indigo snakes to inhabit the project area. Due to the widespread distribution and vast array of habitats that eastern indigo snakes will utilize, it was assumed that the entire project footprint was potential eastern indigo snake habitat (approximately 100 acres). Part of this 100 acres would be lost to indigo snakes when treatment plants are built. However, at this time we don't have a reliable estimate of the footprint of these facilities. A worst case estimate could be 5 acres per facility (that which was presumed for the pilot projects). That would total 40 acres of lost habitat for all 8 treatment facilities. Snakes could likely use well fields after construction once the substrate has been stabilized; therefore, we do not expect a permanent loss of habitat at those locations. The potential for new roads and associated vehicular movement may be a slight threat to the species. Since snakes could be encountered during construction, the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction. Consultation should be reinitiated when more specific details (*i.e.*, site selection) are developed.

Everglade snail kite

Critical habitat for snail kite is present within the lake near the Moore Haven site. However, since this pilot project does not propose any construction activities inside of the lake, we expect no adverse effect on the critical habitat. Well construction will be in upland areas and therefore, should not affect this species. The construction of influent pump stations and discharge structures will probably occur adjacent to water bodies and therefore may effect nesting or foraging kites. However, at this time we do not know the locations of the influent pumps or discharge structures so we cannot ascribe a certain level of effects to kites. A possible worst case scenario would be to predict a loss of 16 acres of shoreline habitat (this assumes two acres of wetland impact for each of the 8 treatment plant's influent pumps and discharge structures).

Florida Panther

This project is within the panther Expansion Area; however, we have no evidence of panther utilization within the project area. We do not have exact locations for the full-scale ASR wells or water treatment plants; however, we anticipate that they will be placed in low-quality panther habitat (they may be placed in non-panther habitat, but we chose to be more conservative). The rationale for assuming placement in low-quality habitat over medium or high-quality habitat is

twofold. First, structures will likely be placed near larger water bodies (*i.e.*, canals in to or out of Lake Okeechobee). This is necessary to ensure a sufficient water supply for the project. Most of these areas are classified by the FLUCCS codes in the 700 (barren or disturbed lands) or 800 (transportation and utilities) series. Second, the study team has a siting process that preferentially avoids placing ASR facilities in high-ecological value areas. Therefore, we anticipate a potential adverse effect to 100 acres of low-quality panther habitat within the Expansion Area for this project.

Okeechobee gourd

According to the Service's database the Okeechobee gourd can be found within and around the western littoral zone of Lake Okeechobee. Given the lack of details for site selection of this project, the worst-case assumption would be a total project loss of 100 acres.

Coordination with the Corps and The District

Officially this project has not yet started, therefore, there has been no coordination on this project.

Section 7 Consultation

No consultation has occurred for this project.

04, 05, 06, 33 C-43 Basin Storage Reservoir - Part 1, C-43 Basin Aquifer Storage and Recovery - Part 2, Caloosahatchee Backpumping with Stormwater Treatment, and Caloosahatchee (C-43) River Aquifer Storage and Recovery Pilot

Caloosahatchee (C-43) Basin project descriptions

Project descriptions and threatened and endangered species footprint analyses for these projects have been combined because they are interrelated and interdependent. A coordinated land acquisition effort is being conducted for all four projects.

04 C-43 Basin Storage Reservoir project description

This project entails above-ground reservoir(s) with a total storage capacity of approximately 160,000 acre-feet within the Caloosahatchee basin (Fig. 04-1). The initial design of the reservoir(s) assumed a total surface area of 20,000 acres with water levels fluctuating up to 8 feet above grade. The purpose of this project is to capture excess storm runoff and releases from Lake Okeechobee. The captured water could then be released into the Caloosahatchee River during times of need or drought (*e.g.*, saltwater intrusion or drought). Anticipated benefits of the proposed project include the use of water normally lost to tide, flood attenuation, improvements of water quality and timing of releases to the Caloosahatchee basin, river, and estuary, protection of the Caloosahatchee estuary from excessive fresh water deliveries, and water supply benefits for environmental, urban, and agricultural users.

To date, no site for above-ground storage has been selected. The Site Selection sub-team has developed a matrix to determine, using appropriate criteria, where above-ground storage may be acceptable in the Caloosahatchee Basin. The sub-team is applying Geographic Information System (GIS) data layers to a preliminary site location map to determine what sites are appropriate. The subteam applied the matrix and ranked all of the potential reservoir locations. Some of the criteria for the matrix included threatened and endangered species, cultural resources, superfund sites and existing infrastructure. For example, a location ranked higher if it already had canals and pumps that would eliminate the need for construction of this infrastructure. From this ranking, sites have been categorized into high, medium, low, and no-go. The subteam further refined the site selection process for alternative development to only include properties that ranked out as high or medium locations.

The analysis conducted for this document reflects only the high and medium parcels of land. These sites include the Berry Groves property, the Duda property north of Lake Hicpochee, in conjunction with Lake Hicpochee, and the River Groves Property, P14 property, adjacent to Berry Groves, P3E, south of Lake Hicpochee, and P13 property (Fig. 04-2). Each of these sites includes existing canals and pumps necessary for the CERP projects. Even though the Lake Flirt infrastructure change ranked out as a high potential project, it entails adding a lock to the Caloosahatchee River. After discussions with the Project Leaders from both the Corps and the District, the Site Selection Subteam decided that this alternative would not be feasible due to the adverse effect on manatee. Therefore, the Lake Flirt location is no longer an option.

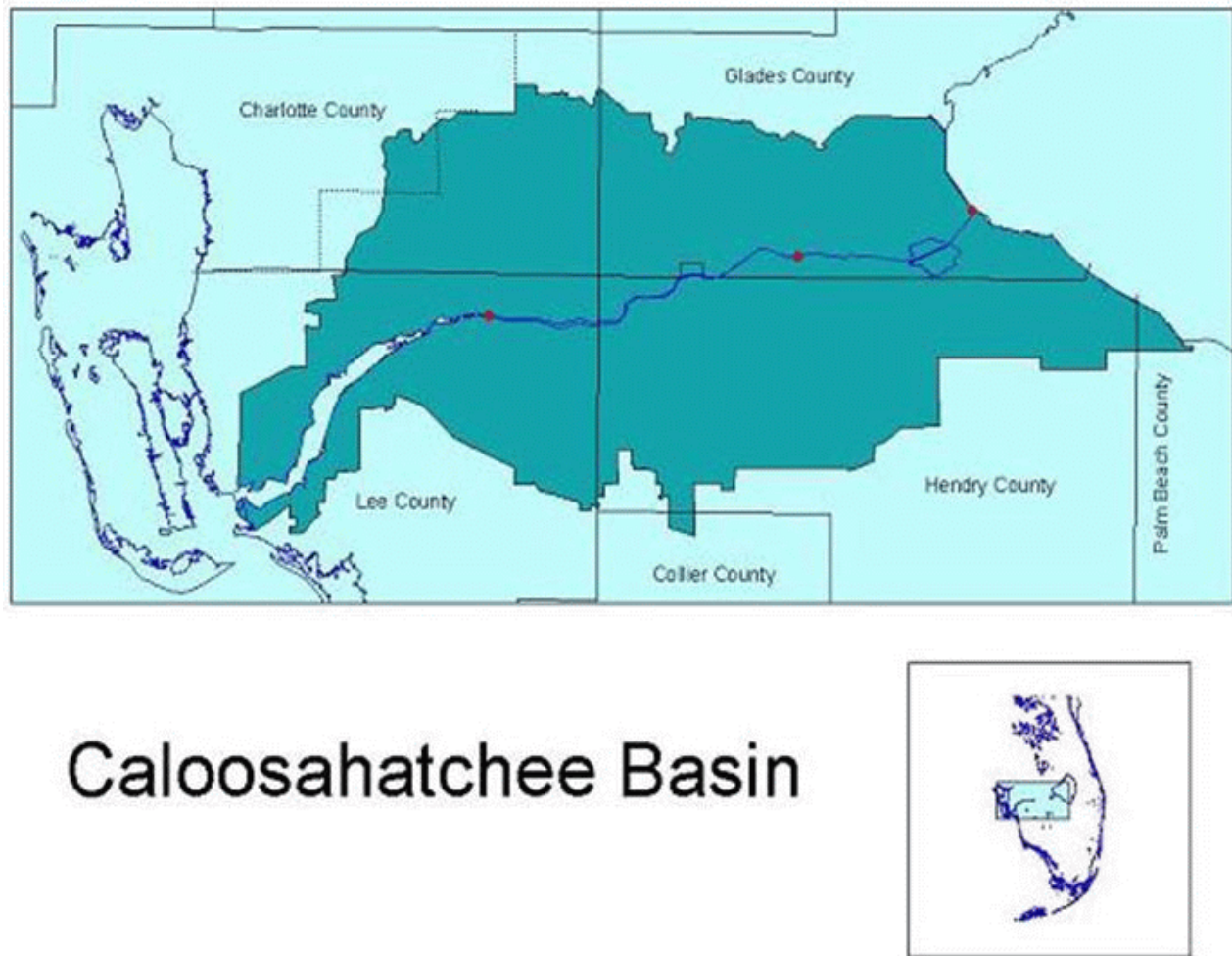


Figure 04-1. Geographic boundary of the project area for Comprehensive Everglades Restoration Plan projects located in the Caloosahatchee Basin. The red dots indicate locks along the C-43 canal.

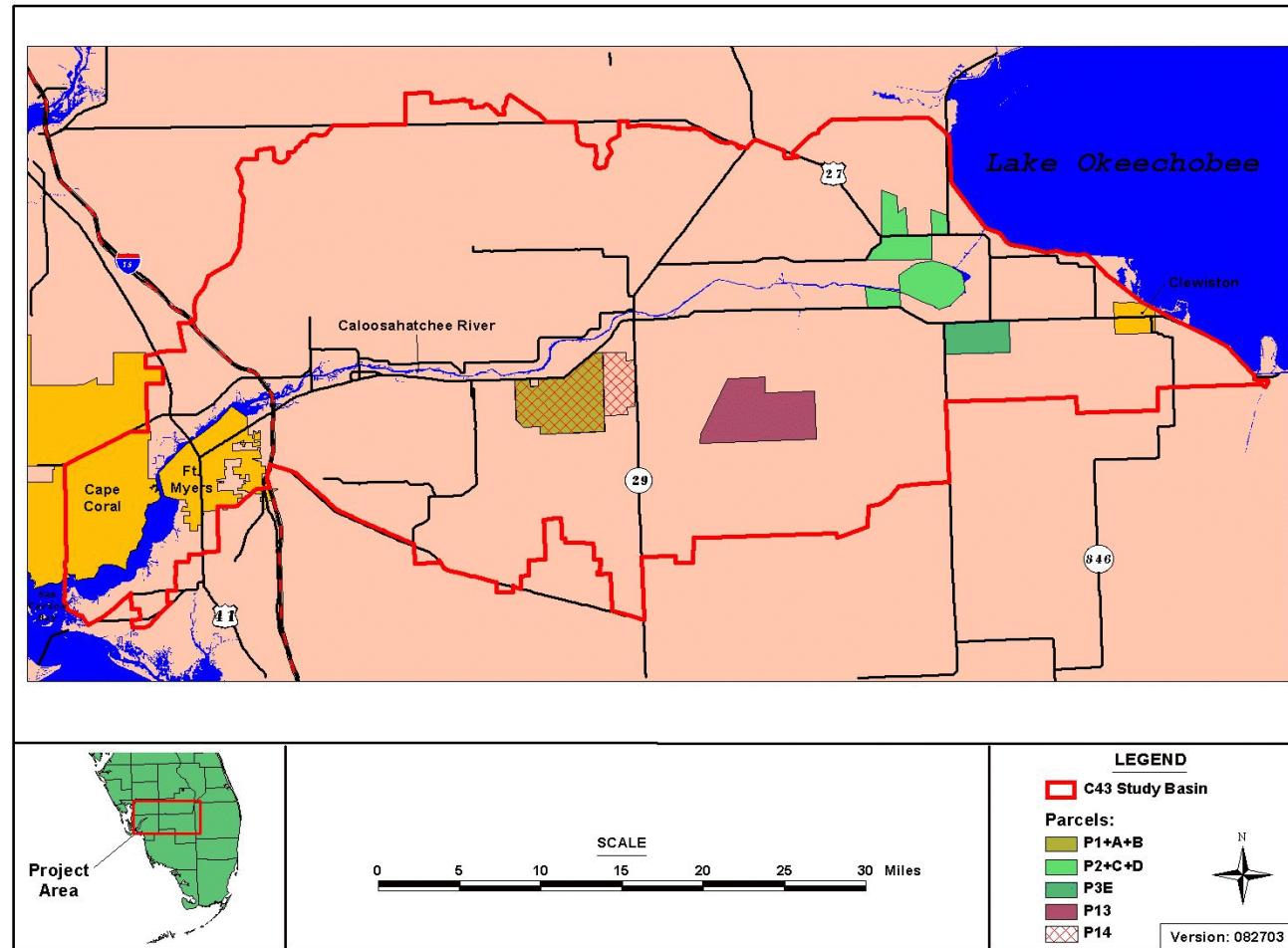


Figure 04-2. Potential locations for Comprehensive Everglades Restoration Plan projects within the Caloosahatchee Basin. P1+A+B is the Berry Groves property, P2+C+D is the Duda and River Groves property, P3E is the Eastern Distributed Reservoir property, P13 is the South-Central property and P14 is the Paul Property.

A preliminary list of properties available from willing sellers has been developed (Table 04-1) and is being evaluated as potential reservoir sites.

The 12,903 acre Berry Groves property, located in Hendry County, may be selected as a reservoir location. Assuming an 8-foot maximum depth of storage, the Berry Groves reservoir could potentially hold approximately 103,000 acre-feet of water. The property is currently in agricultural production with citrus as the primary crop. In addition to the Berry Groves property, other sites within the Caloosahatchee Basin have been proposed for reservoir development. The total acres of these proposed locations is 50,797. Lake Hicpochee is included in this analysis, but not as a reservoir. We are in the preliminary discussions on using Lake Hicpochee as a water treatment area if the Duda property or the River Groves property are selected for a reservoir location. Therefore, Lake Hicpochee could have additional water placed on it, to assist in managing water at the Duda property. All of these remaining potential locations will be further analyzed during the alternative selection process.

Table 04-1. A list of Caloosahatchee Basin properties, and their estimated acres, available from willing sellers being evaluated as potential sites for Comprehensive Everglades Restoration Plan projects in the basin.

Potential Reservoir Sites	Acres
Berry Groves (P1 + A + B)	12,903
Duda + River Groves (P2 + C+ D)	13,746
Eastern Distributed Reservoir (P3E)	5,077
South-Central (P13)	14,480
Paul (P14)	4,591
TOTAL ACRES	50,797

C-43 Basin ASR project description - part 2

The ASR concept is to store partially treated, available surface water or groundwater in ASR wells, within the Floridan Aquifer System for subsequent recovery during periods of need. Among other benefits, implementation of ASR technology within the Caloosahatchee River Basin could help to minimize high-volume water releases to the Caloosahatchee Estuary. The potential advantages of ASR are the following: (1) reduced costs and space for land acquisition compared with surface storage facilities; (2) underground storage eliminates water losses due to evapotranspiration; (3) wells can be located in areas of greatest need, depending on geology,

reducing water distribution costs; and (4) provides the ability to recover large volumes of water during severe droughts, presumably when reservoir levels would be low.

The purpose of the full-scale Caloosahatchee River ASR project is to work in tandem with the C-43 Basin Storage Reservoir project (taking place concurrently). Both of these projects are intended to deliver water for environmental restoration of the Caloosahatchee Estuary (including an enhanced salinity range, conducive to estuarine species), water supply, and water quality benefits.

The ultimate design of the Caloosahatchee River ASR system (with construction beginning in 2008) envisioned in the CERP includes 44 wells, each with the capacity of 5 mgd, with ultra filtration and chlorination for pre-treatment, and aeration for post-treatment. The level and extent of treatment and the actual number of wells for the full-scale Caloosahatchee River ASR component of CERP may be modified based on findings from the Caloosahatchee ASR Pilot-Project and other studies in various stages of development. For the purposes of this analysis, we have assumed that the footprint of the 44 wells will be contained within the 20,000 acre footprint of the C-43 Basin Storage Reservoir project.

The Caloosahatchee River ASR Project is proposed to take place at one of the potential sites for the C-43 Basin Storage Reservoir in the Caloosahatchee Basin. One potential site is Berry Groves, located southwest of LaBelle. At this time, the Berry Groves property is only one of several potential sites for reservoir use within the Caloosahatchee Basin (Table 04-1).

06 Caloosahatchee Backpumping with Stormwater Treatment project description

The C-43 Basin Storage Reservoir will be operated in conjunction with the Caloosahatchee Backpumping feature, which includes an STA for water quality treatment. This feature includes pump stations and an STA with a total capacity of approximately 20,000 acre-feet located in the eastern C-43 Basin in Hendry and Glades counties. The initial design of the STA assumed 5,000 acres with the water level fluctuating up to 4 feet above grade. The final size, depth, and configuration of this facility will be determined through more detailed planning and design.

The purpose of this feature is to capture excess C-43 Basin runoff, which will be used to augment regional water system water supply. This feature operates after estuary and agricultural/urban demands have been met in the basin and when water levels in the C-43 storage reservoir exceed 6.5 feet above grade. Lake Okeechobee must also be considered to have available storage. When these conditions are met, a series of pump stations will backpump excess water from the reservoir and the C-43 Basin to Lake Okeechobee after treatment through the STA. The STA will be designed to meet Lake Okeechobee phosphorus and other pollutant loading reduction targets consistent with the Surface Water Improvement and Management Plan

for the Lake and future appropriate pollution load reduction targets which may be developed for the Lake and the watershed in which the facility is to be located.

The Site Selection sub-team of the C-43 Basin Storage Reservoir PDT is also working on site selection for the stormwater treatment features. Table 04-1 provides a list of potential sites available from willing sellers.

33 Caloosahatchee (C-43) River ASR-Pilot

The Caloosahatchee River ASR Pilot project will serve as a test case for the full scale Caloosahatchee ASR project and is proposed to take place at the Berry Groves site. The location of the Pilot's exploratory well has been selected (Fig. 04-3). The footprint of the ASR Pilot Project is located on 5 acres of the Berry Groves property. The 5-acre footprint is currently degraded and barren habitat that would be of little value to fish and wildlife.

Surface water from adjacent canals will be used as the source of water for this pilot project. The District is currently conducting source water quality characterization tests on canal water that would be going into the Caloosahatchee ASR Pilot Project. Data was collected quarterly from July 2002 through June 2003 from the potential source water in the Townsend canal.

The ASR Pilot Project is anticipated to consist of the following components:

- a. One ASR well in the upper Floridan Aquifer System, with an anticipated capacity of 5 mgd.
- b. A source-water collection system that will supply surface water to the ASR system. The source water will depend on geotechnical investigations and water quality testing to be conducted early in the pilot project implementation. The source of water for the ASR pilot project will likely be either the Header or Townsend canals.
- c. A source water treatment facility.
- d. Piping between the source water collection system, ASR wells, and discharge point(s).
- e. Surface facilities (*e.g.*, pumps, valves, meters, instrumentation, etc) to operate and monitor the system.
- f. Associated monitoring wells (Floridan Aquifer System and Surficial Aquifer System).

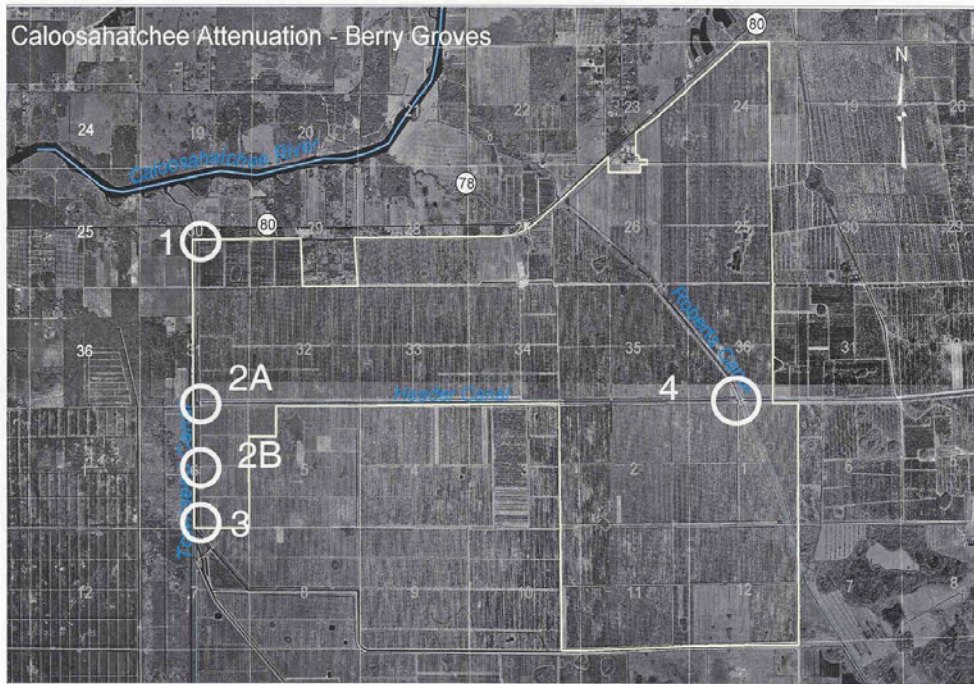


Figure 04-3. Berry Groves site with five locations considered for the Aquifer Storage and Recovery pilot project site. Site 2A was chosen (Figure 1; Service 2002).

C-43 Basin projects setting and principal habitats

The Caloosahatchee basin encompasses Hendry, Glades, Lee and a small portion of Charlotte, Collier, and Palm Beach counties (Fig. 04-1). The ecological communities of south Florida represent a continuing succession, resulting in the development of a mosaic of pine forest, cypress strands, hardwood hammocks, coastal mangrove forests and salt marsh, sawgrass plains, and wet prairies (Carter et al. 1973). The natural systems within the Caloosahatchee basin consist of wetland (freshwater swamps, sloughs, marshes, and estuaries) and upland (pine flatwoods, temperate oak/palmetto hammocks, tropical hammocks, dry prairie, and xeric scrub) communities. Table 04-2 lists the habitat types identified within the areas being offered by willing sellers that are under consideration for use as locations for these projects.

Table 04-2. Land cover types (FLUCCS) and estimates of acres of each cover type within the properties listed in Table 04-1. These area are being considered for siting of Comprehensive Everglades Restoration Plan Caloosahatchee Basin projects.

Code	Description	Acres
211	Improved Pastures	2,376
212	Unimproved Pastures	1,124
214	Row Crops	37
215	Field Crops	7,459
221	Citrus	30,674
252	Dairies	20
261	Fallow Crop Land	481
329	Other Shrubs	37
330	Mixed Rangeland	161
411	Pine Flatwoods	72
427	Live Oak	12
438	Mixed Hardwoods	41
510	Streams & Waterways	329
617	Mixed Wetland	3,462
621	Cypress	98
624	Cypress Pine	4
630	Wetland Forested Mix	148
641	Freshwater Marshes	2,305
643	Wet Prairies	273
816	Canals & Locks	151

Although classified as different habitats, these systems are interdependent. A number of these systems are relatively pristine areas and are recognized as having regional significance. These areas serve as important habitat for a wide variety of wildlife and have numerous hydrological functions.

The major wetland system in the Caloosahatchee basin is Twelve-Mile Slough. It is located in Hendry County and is a tributary to the much larger and regionally significant Okaloacoochee Slough. The Twelve-Mile Slough covers 3,300 acres and contains a mosaic of freshwater wetlands, as well as pine flatwoods and oak/cabbage palm hammocks.

The upland communities with the Caloosahatchee basin include flatwoods and tropical hammocks. Flatwoods are the most dominant upland habitat and are divided into two types: dry and hydric. An open canopy of slash pine with an understory of saw palmetto characterizes dry flatwood communities. Hydric flatwood communities are vegetatively similar to dry flatwoods but are located in a slightly lower elevation and are seasonally inundated.

Tropical hammocks are diverse woody upland plant communities. They are scattered but not widespread throughout the Caloosahatchee basin. Tropical hammocks occur on elevated areas, often on Indian shell mounds along the coast or on marl or limestone outcrops inland. These are among the most endangered ecological communities in south Florida.

Dry prairie is essentially a treeless, a fire produced landscape with a ground cover diverse in regionally endemic plant taxa and dominated by wiregrass, scattered, low, stunted saw palmetto and low-growing runner oak. The typical dry prairie has a mixture of upland and wetland plants. The portions of the study area that were historically dry prairie have been subject to drainage, conversion to pasture, and other human-caused alterations. Based upon DeSelm and Murdock (1993), Noss et al. (1995) considered ungrazed dry prairie of Florida as an endangered community (greater than 98 percent habitat loss and continued threat).

Upland plant communities serve as recharge areas, absorbing rainfall into soils where it is distributed into plant systems or stored underground within the aquifer. Ground water storage in upland areas reduces runoff during extreme rainfall events, while plant cover reduces erosion, and absorbs nutrient(s) and other pollutants that might be generated during a storm event.

The Service recommends minimizing the effects of the C-43 projects on native habitats as a first priority. Although grazed lands, particularly improved pastures, are not among the native habitats of Florida, they do retain habitat value for a variety of fish and wildlife, most notably Audubon's crested caracara, Florida grasshopper sparrow, Florida sandhill crane, Florida burrowing owl, gopher tortoise, Eastern indigo snake, short-tailed hawk, and gopher frog. Therefore, as a second priority, we recommend that, if siting of reservoirs allows a choice of lands with different agricultural land use histories, areas supporting citrus and sugar cane be selected in preference to unimproved or improved pastures. However, given the abundance of pastures in the study area, it is understood that conversion of some pastures to reservoirs will most likely be part of the project design. Protection and restoration of the native habitats in the region will broadly benefit fish and wildlife, and will assist in recovery of federally listed species.

Effects analysis for the C-43 Basin projects

As shown in Table 04-3, 19 federally listed species are known to occur in Hendry, Glades, Lee, Charlotte, Collier, and Palm Beach counties, and three of these species have a portion of their designated critical habitats within or adjacent to the study area. The direct and indirect effects of the project as a whole would potentially benefit or adversely effects several of these species.

Table 04-3. Federally listed threatened and endangered species in Hendry, Glades, Lee, Charlotte, Collier, and Palm Beach Counties.

Scientific Name	Common Name	Status
Amphibians and Reptiles		
<i>Caretta caretta</i>	Loggerhead sea turtle	T
<i>Chelonia mydas</i>	Green sea turtle	E
<i>Crocodylus acutus</i>	American crocodile	E
<i>Dermochelys coriacea</i>	Leatherback sea turtle	E
<i>Drymarchon corais couperi</i>	Eastern indigo snake	T
<i>Eretmochelys imbricata</i>	Hawksbill sea turtle	E
<i>Lepidochelys kempii</i>	Kemp's (=Atlantic) ridley sea turtle	E
Birds		
<i>Ammodramus savannarum floridanus</i>	Florida grasshopper sparrow	E
<i>Aphelocoma coerulescens</i>	Florida scrub jay	T
<i>Charadrius melodus</i>	Piping plover	T*
<i>Haliaeetus leucocephalus</i>	Bald eagle	T
<i>Mycteria americana</i>	Wood stork	E
<i>Picoides borealis</i>	Red-cockaded woodpecker	E
<i>Polyborus plancus audubonii</i>	Audubon's crested caracara	T
<i>Rostrhamus sociabilis plumbeus</i>	Everglade snail kite	E*
Mammals		
<i>Felis concolor coryi</i>	Florida panther	E
<i>Trichechus manatus</i>	West Indian manatee	E*
Plants		
<i>Cucurbita okeechobeensis</i>	Okeechobee gourd	E
<i>Deeringothamnus pulchellus</i>	Beautiful pawpaw	E

*Critical Habitat present

For the purposes of this analysis, we have combined the potential acres for the four projects for a 25,000 acre total footprint, assuming that the ASR facilities will be located within the footprints given for the 2 non-ASR projects. Since no decisions have yet been made on placement of the larger features, we have analyzed a worst case scenario for each species, totaling the amount of suitable habitat available for each within the willing seller properties, up

to the 25,000 acre maximum. Table 04-4 list the amounts of possible habitat loss for each species based on FLUCCS data within the properties available from willing sellers.

Table 04-4. Estimated acres of possible habitat effects to seven threatened and endangered species resulting from Comprehensive Everglades Restoration Plan projects within the C-43 Basin by Florida Land Use and Cover, and Forms Classification System (FLUCCS).

FLUCCS Code	Red-cockaded Woodpecker	Bald Eagle	Grasshopper Sparrow	Everglade Snail Kite	Audubon's Caracara	Wood Stork	Eastern Indigo Snake
211			2,376		2,376	2,376	2,376
212			1,124		1,124	1,124	1,124
214					37	37	37
215					7,459		
215						7,459	7,459
221					30,674	614	30,674
252					20		20
261					481		481
329							37
330							161
411	72	72					72
427					12		12
438	41						41
510				329		329	329
617				3,462		3,462	3,462
621	98			98		98	98
624	4					4	4
630	148			148		148	148
641				2,305	2,305	2,305	2,305
643			273	273	273	273	273
Total Acres	363	72	3,773	6,615	44,761	18,229	49,113

Everglade snail kite

Critical habitat for the snail kite is present immediately adjacent to the Caloosahatchee basin inside of the Herbert Hoover Dike in Lake Okeechobee. It is likely that the snail kite forages in a number of native wetlands and in canals and ditches within the project area.

Harm: 6,615 acres of beneficial habitat may be lost or altered through construction of the C-43 basin projects by the removal or negative alteration of potential foraging habitat for snail kites.

Benefit: At this time, no perches are scheduled to be placed around any of the potential reservoir locations. Therefore, we have assumed that there will be no suitable foraging habitat for snail kites associated with these reservoir locations.

Recommendations: Benefits to snail kites could be realized by planning for suitable perches around the reservoirs. Additionally, use of a distributed reservoirs design for these projects could provide additional foraging habitat for snail kites.

Wood stork

The wood stork is primarily associated with freshwater and estuarine habitats for nesting, roosting, and foraging. They have nested, at one time or another, in every county in south Florida. Of the 5 sites analyzed for this exercise, 2 of the potential reservoir locations are within designated 18.6-mile wood stork CFAs. The Berry Groves and the Paul property (P1 + A + B + P 14) are within four CFAs and the South Central (P13), is within one CFA. Therefore, the Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning.

Harm: 18,229 acres of beneficial habitat may be lost or altered through construction of the C-43 basin projects by the removal or negative alteration of potential foraging habitat.

Benefit: At this time, no littoral shelves are proposed for any of the potential reservoir locations. Therefore, we will not count the reservoir edges as habitat for wood storks.

Recommendations: Benefits to wood storks could be realized by planning for littoral shelves within the reservoirs. Additionally, use of a distributed reservoirs design for these projects could provide additional foraging habitat for wood storks.

Bald eagle

The five potential reservoir locations do not overlap the Primary or Secondary Zones of any bald eagle nests. However, some potential nesting habitat does occur within the willing-seller parcels.

Harm: 72 acres of potential nesting habitat may be lost or altered through construction of the C-43 basin projects. At this time, no new pumps, with the associated electrical lines near open water, are proposed to operate the reservoirs, ASR wells, or the backpumping project.

Benefit: No new canals are proposed at this time for these projects, so additional canal foraging habitat has not been tallied for this report. Also, no perches are proposed at this time in

association with the proposed reservoir locations so the reservoirs have not been counted as foraging habitat.

Recommendations: Benefits to bald eagles could be realized by planning for suitable perches around the reservoirs. Additionally, use of a distributed reservoirs design for these projects could provide additional foraging habitat for bald eagles.

Audubon's crested caracara

Caracaras are found in the prairie area of the south-central region of the state. Because the Service anticipates that areas to be identified for reservoirs in addition to the Berry Groves property will include unimproved and improved pastures (land cover types which are preferred as habitat by the caracara and other species of wildlife), the C-43 projects will likely have an adverse effect on this species. We believe it would be impractical to set a planning goal to entirely avoid effects on this species, but rather, to direct siting of the additional reservoirs into areas with less intensive use by caracaras. In general, siting reservoirs in areas currently sustaining sugarcane or citrus, rather than unimproved and improved pastures, would reduce effects on the caracara, and other wildlife, such as the Florida grasshopper sparrow, the and state-listed burrowing owl and Florida sandhill crane.

Harm: 25,000 acres of beneficial habitat may be lost or altered through reservoir(s) construction within the Caloosahatchee Basin by the removal or negative alteration of potential nesting and foraging habitat for caracara. The Duda property north of Lake Hicpochee is an area of juvenile caracara congregation that is particularly important to this species. This site should therefore be avoided if at all possible. A total of 6,817 acres would be effected if this property is selected for a reservoir. The Service's *Habitat Management Guidelines For Audubon's Crested Caracara In Central and Southern Florida* should be consulted during project planning.

Florida grasshopper sparrow

The Florida grasshopper sparrow is now known to occur only from Highlands, Okeechobee, Osceola, and Polk counties, but potential habitat is present within Glades county, which brings it into the study area considered here. The Florida grasshopper sparrow has a highly restricted range in Florida and is critically endangered. Florida Natural Areas Inventory records include reports of the species from northwestern Glades County, but little is known about the possible presence of the species on private lands in the southern part of the county, closer to the Caloosahatchee River. The study team may be unable to gain access to conduct surveys on private lands in the plan formulation period. Therefore, the Service believes the planning goal for this species should be to avoid effects not only on currently occupied habitat, but also on potential habitat important to recovery of the species. As a starting point, an analysis of aerial photography by Shriver and Vickery (1999) identified potential habitat for the grasshopper sparrow, which includes some areas extending from northern Glades County south to the vicinity

of the Caloosahatchee River. Avoidance of these areas in selecting sites for additional reservoirs is recommended, while we attempt to gather additional information from surveys of private lands in the area, if possible. The *U.S. Fish and Wildlife Service Florida Grasshopper Sparrow Conservation Guidelines* should be consulted during project planning.

Harm: 3,773 acres of potential habitat may be lost or altered through construction of the C-43 basin projects. 3,715 of these acres are on the Duda and River Groves property and the remaining acres are on the South-Central property.

Florida scrub-jay

Because the scrub habitats occupied by this species occur at higher elevations and have highly drained soils, these areas are typically poorly suited for siting water storage or treatment areas, so avoidance of these areas is not only ecologically sound, but is also justified by functional considerations. Since only 3 acres of these habitat types are present within the willing seller parcels, avoidance should not impact the project purposes and we will assume for this analysis that these three acres will not be included in the C-43 basin project footprints. However, if the areas for reservoir locations change, then the Corps would need to re-address the Florida scrub-jay and the effects to this species.

Harm: None anticipated.

Red-cockaded woodpecker

The distribution of this species on private lands in the study area is poorly documented, and it is uncertain that the planning team members will obtain permission from private landowners to conduct surveys during plan formulation. The Service recommends minimizing the conversion of pine flatwood habitats to water storage or treatment areas.

Harm: 363 acres of potential nesting and foraging habitat may be lost or altered through construction of the C-43 basin projects.

Eastern indigo snake

The threatened eastern indigo snake is present throughout the state, but its abundance is reduced to a point where it is uncommon. Eastern indigo snakes could be encountered during construction, therefore implementation of the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Harm: 25,000 acres of suitable habitat will be lost or altered through construction of the C-43 basin projects. Littoral shelves with interspersed uplands, are not proposed at this time for the reservoir(s), therefore, we cannot count this as habitat for the snake. There is no plan to

intersperse uplands in the reservoir or the STAs at this time. Therefore, these would not provide habitat for the snake.

Benefit: The perimeter for each potential reservoir location has been calculated and multiplied by 6 feet, the average width of a levee, to give us an estimate of potential beneficial habitat that could be used by the snake. Therefore, we estimate that 79.28 acres of levee top could be habitat for the snake.

West Indian manatee

The endangered West Indian manatee is regularly found in the Caloosahatchee River and the Charlotte Harbor estuary. In addition to the Service's concerns about boat-caused mortality throughout the species' range, navigational locks along the Caloosahatchee River have a history of causing manatee mortality. Sixteen navigational lock/water control structure-caused manatee deaths have been recorded near Ortona Lock (S-78) between 1980 and 2001. Throughout those same years, six were discovered near S-77 at Moore Haven, and one in 1999 at the Franklin Lock (S-79). Existing operational protocols for the structures and locks are important considerations in reducing these deaths. In addition, the C-43 Basin projects should ensure that changes in water flows at these existing structures, and that construction, as part of this project, of any new structures in waters accessible to manatees, do not increase the risks to the species. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during project construction. The manatee may be affected by the water management plan to be developed in response to the increased storage of water in the reservoir(s). It is well documented that manatees require fresh water to survive. In addition to the fresh water needs, development of a draft water control plan as part of the Project Implementation Report (PIR) should be based on modeling to estimate any changes in abundance and distribution of submerged aquatic vegetation in the Caloosahatchee estuary. The distribution of these beds in proximity to warm water refugia for manatees is also an important factor. If Submerged aquatic vegetation beds are eliminated close to their warm water refugia, manatees may be subject to more threats while traveling a greater distance to reach a suitable food source.

Harm: Construction and operation of new structures located in areas accessible to manatees, could harm or harass manatees. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented in areas accessible to manatees.

Benefit: The potential to restore a more natural flow down the Caloosahatchee River and into the estuary, possibly providing more productive tape grass and sea grass beds for manatee foraging.

Florida panther

The panther presently occupies a contiguous system of large private ranches and public conservation lands in Broward, Collier, Glades, Hendry, Lee, Miami-Dade, Monroe, and Palm Beach counties.

The Caloosahatchee basin plays an important role in the recovery of the Florida panther. The Service organized a multi-agency subgroup of the Multi-species Ecosystem Recovery Implementation Team to produce the *Landscape Conservation Strategy for the Florida Panther in South Florida* (Service 2002a). In addition to protection of habitat for adult home ranges, the strategy includes provision of corridors for dispersal of juveniles between larger areas of contiguous habitat. Dispersal across the Caloosahatchee River, between existing primary habitat south of the river and habitat that is presently only occasionally used by panthers north of the river, is considered essential for recovery of the species. The Service's planning team participant for the C-43 reservoir project will continue to coordinate with the Florida Panther Subteam of the Multi-species/Ecosystem Recovery Implementation Team to ensure that project design is compatible with recovery efforts for the panther.

Harm: A total of 25,000 acres of panther habitat may be lost or altered through construction of the C-43 Basin projects. Ten acres of high quality habitat, 1 acre of medium quality habitat and 776 acres of low quality habitat are within the Primary/Dispersal Zone. Within the Secondary Zone, there are 2,015 acres of high quality habitat, 46 acres of medium quality habitat and 26,907 acres of low quality habitat that may be effected. The remaining acres consists of 325 acres of high quality habitat, 2,323 acres of medium quality habitat and 3,827 acres of low quality habitat within the Expansion Zone.

Okeechobee gourd and beautiful pawpaw

Two endangered plants are found in or near the study area, the Okeechobee gourd and the beautiful pawpaw. The Okeechobee gourd is a vine that is now restricted in the wild to two small disjunct populations: one along the St. Johns River which separates Volusia, Seminole, and Lake counties in north Florida, and a second around the shoreline of Lake Okeechobee in south Florida. The Okeechobee gourd is not known to be present in the Caloosahatchee basin, but in the adjacent littoral zone of Lake Okeechobee. Therefore, the C-43 Reservoir project should be assessed only for any indirect effects on water management in the lake, as opposed to any direct effects of siting and construction of the reservoirs on this species.

The beautiful pawpaw is a low shrub of the Annonaceae family that occurs in two disjunct locations in central and southwest Florida. It is found in xeric, mesic, and hydric pine flatwoods in western Charlotte and Lee Counties and eastern Orange County. The main documented sites for the beautiful pawpaw in Lee County are on Pine Island, which is at the periphery of the study area, and on the Fred C. Babcock - Cecil M. Webb Wildlife Management Area. Neither of these

areas are included within the willing seller parcels. However, there is a slight chance that the species may be discovered in pine flatwoods communities within Charlotte and Lee Counties.

Similar to the red-cockaded woodpecker, the Service recommends that siting of reservoirs avoid pine flatwoods. Any properties within Charlotte and Lee Counties that contain pine flatwoods and are considered for acquisition as part of these projects should be thoroughly surveyed for the presence of the beautiful pawpaw prior to selection of a preferred alternative.

Harm: 72 acres of potential habitat within the Caloosahatchee Basin may be lost or altered through reservoir(s) construction by the removal or negative alteration of potential Okeechobee gourd and beautiful pawpaw habitat.

Sea turtle species

The Service has consultation responsibilities for sea turtle nesting, and although sea turtles are known to nest on beaches in the region, the project should have no effect on nesting. The project could have an indirect effect on marine and estuarine habitats used by sea turtles, and consultation for these potential effects should be conducted with the National Oceanic and Atmospheric Administration - Fisheries (NOAA-Fisheries).

Benefit: The potential to restore a more natural flow down the Caloosahatchee River, into the estuary, possibly providing more productive foraging areas for sea turtles.

State-listed species

Our preliminary review indicates that several wildlife species are likely to occur in the study area that are listed as endangered, threatened, species of special concern, or are considered rare by the State of Florida. Among reptiles, the American alligator is a species of special concern, and the gopher tortoise is threatened. Several wading bird colonies are present in the study area, and should be considered. Among the species known to nest in the area are the tricolored heron, little blue heron, white ibis, and the snowy egret; these are all listed as species of special concern. The black skimmer, osprey, American oystercatcher, and the brown pelican are all listed as species of special concern, and we expect these to be present in the Caloosahatchee estuary. The Florida sandhill crane is state-listed as threatened and is widely distributed in the study area. The burrowing owl is a species of special concern. The Florida black bear and the Big Cypress fox squirrel are known to occur south of the Caloosahatchee River and are state-listed as threatened. We recommend that the Corps consult with the Florida Fish and Wildlife Conservation Commission as planning advances regarding potential impacts to State-listed wildlife.

Coordination with the Corps and The District

Earlier versions of these project descriptions were provided to the project leads of both the District and the Corps. The District responded and their comments were reviewed and incorporated into this document.

April 11, 2002. Planning Aid Letter (PAL). C-43 Basin Storage Reservoir.

May 8, 2002. PAL. Caloosahatchee ASR Pilot Projects.

June 2002. PAL. Caloosahatchee ASR Pilot Project

March 10, 2003. E-mailed the Corps and the District the project descriptions for the C-43 Basin Storage Reservoir and Caloosahatchee Backpumping Projects, requesting comments.

March 20, 2003. Discussed the project descriptions with the Corps and District project leads at the C-43 Basin Storage Reservoir PDT meeting. We requested any comments that they may have. To date, we have not received any comments from either the Corps or the District.

June 10, 2003. National Environmental Policy Act Comment Letter. C-43 Basin Storage Reservoir.

August 13, 2003. PAL. C-43 Basin Storage Reservoir.

March 4, 2003. Robert Verrastro of the District was contacted to discuss number and location of ASR wells. He indicated that the total number of wells that can operate simultaneously depends on a great number of variables that will likely be elicited from the pilot project. The ASR project may or may not require 44 wells and more than one location may be required (not just siting on Berry Groves).

March 10, 2003. Project description e-mailed to the District project manager (Robert Verrastro) for review and comment.

March 11, 2003. Robert Verrastro e-mailed comments and suggestions on the project descriptions. He indicated that an exploratory well for the Caloosahatchee River ASR Pilot Project was planned for June 2003 on the Berry Groves site.

March 11, 2003. Project description e-mailed to the Corps (Richard Dasher) project manager for review and comment.

March 19, 2003. A site visit of Berry Groves was conducted.

As stated above, a site selection sub-team has been formed and Service personnel are chairing the team. To date, a preliminary site selection map for reservoir locations has been developed. This map contains willing land owners, various infrastructure changes that may hold back water as well as distributed wetlands that may hold back water. The Service has been very active in this sub-team in guiding and planning with the Corps and the District in appropriate areas for storage that will not adversely affect listed species. The Service has recommended an area along the Caloosahatchee river that would meet both the needs of receiving water for a reservoir in close proximity to the river and where there is little or no effect to listed species. Furthermore, we have provided GIS coverages to assist the Corps and the District in planning reservoirs. We have also advised these agencies in keeping their site selections to disturbed habitats or agricultural lands where the habitat is already degraded and unsuitable for many listed species.

Section 7 Consultation

The District has accelerated the Caloosahatchee ASR project at the Berry Groves location. The District applied for and received a 404 permit from the Corps. The type of 404 permit issued was a Nationwide 18 permit which allows for construction of small projects with minimal effects. The Corps regards issuance of this permit as having fulfilled National Environmental Policy Act and section 7 requirements. No formal section 7 consultation has been conducted on the other Caloosahatchee Basin CERP projects.

Indian River Lagoon - South project description

The southern Indian River Lagoon (IRLS) estuary system has been degraded by large and rapidly occurring nutrient-laden discharges of stormwater during the rainy season, and by an excessive accumulation of muck in estuary and lagoon bottoms. Together these stressors have reduced water clarity and exceeded the salinity tolerances of submerged vegetation and benthic animals. Recommended plan elements include building and operating approximately 12,000 acres of new inland reservoirs, approximately 9,000 acres of new stormwater treatment areas, restoring hydrology on about 97,820 acres of lands in the watershed, including improvements in freshwater flows to 3,100 acres of floodplain wetlands in the North Fork of the St. Lucie River. The plan also includes building pumps, levees, canals and other structures to operate and interconnect project features and provide a mechanism for redirecting freshwater discharges to the North Fork of the St. Lucie River; and muck removal and habitat restoration actions inside the estuaries. These features would significantly reduce harmful discharges into the receiving waters, provide water quality treatment, provide water storage in the natural system, and provide an additional source of agricultural water supply, while maintaining current Central and Southern Florida Project purposes. The recommended plan would also improve habitat for natural populations of flora and fauna, including threatened and endangered species.

C-44 Basin

The recommended plan includes four components within the C-44 Basin (see Fig. 07-1). These components include the C-44 West Reservoir and STA, C-44 East STA, and Palmar Complex - Natural Storage and Water Quality Treatment Area.

The C-44 West Reservoir and STA includes a 3,705-acre above ground reservoir with a maximum depth of 10 feet and a 2,575-acre STA with a maximum depth of 4 feet and normal operating depth of 2 feet. The total storage capacity of the reservoir and STA is approximately 36,750 acre-feet. This feature is located on the north side of the C-44 Canal immediately east of Lake Okeechobee. The primary purpose of the reservoir is to capture and detain stormwater originating in the C-44 Basin thereby reducing the volume and the flow rate of stormwater entering the St. Lucie Estuary through the existing S-80 Structure. The pump station will be designed to provide up to a 1,100-cfs removal rate from the C-44 Canal. Water captured by the reservoir is pumped at a maximum rate of 200 cfs into one of the 2 chambers of the STAs located on the north side of the reservoir. Water released from the STA can be directed either to Lake Okeechobee through S-135 or back to the C-44 Canal via the L-65 borrow canal and structure S-153.

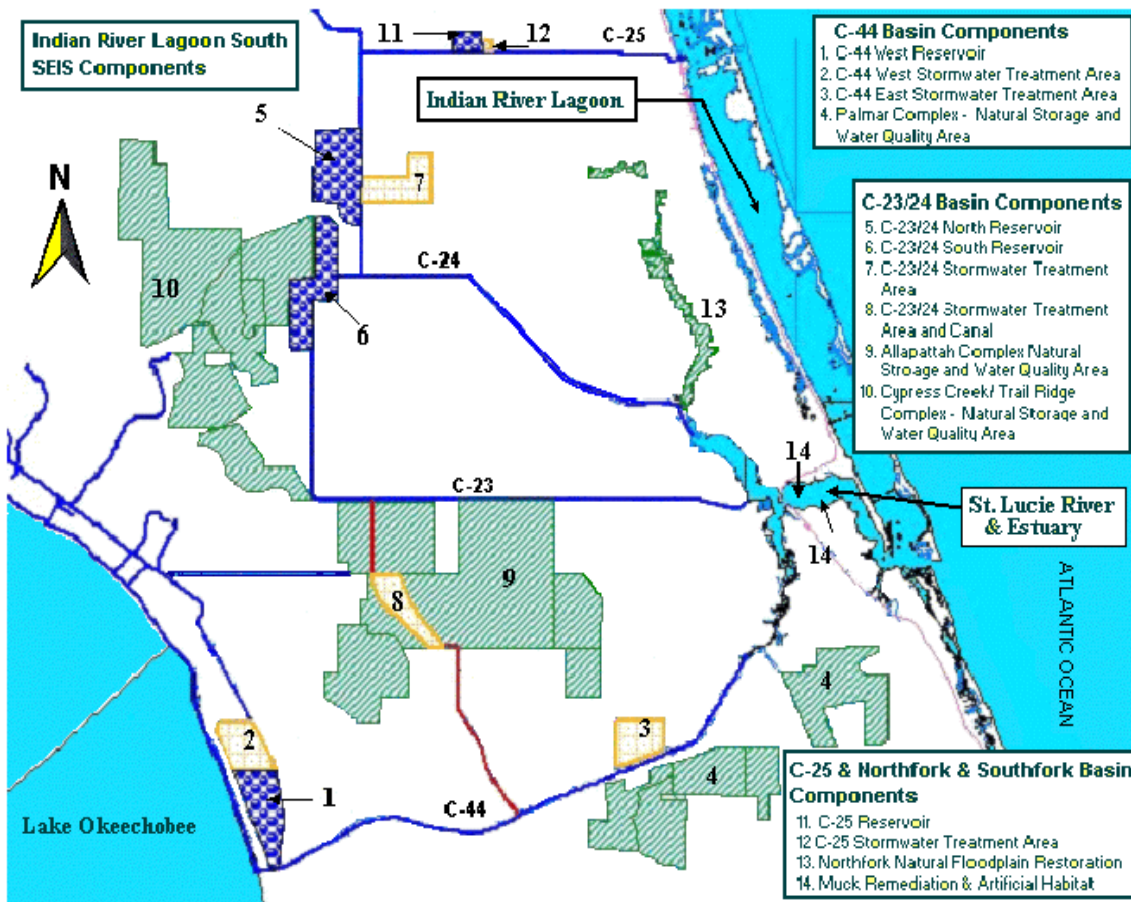


Figure 07-1. Indian River Lagoon - South project area and components (Figure S-1; Corps 2002a).

The C-44 East STA will be approximately 2,222 acres in size and will be located on the north side of C-44. The purpose of this STA is to treat C-44 basin waters that are being discharged into the St. Lucie Estuary through the S-80 structure. A pump station with a maximum capacity of 250 cfs will be utilized to pump water into the STA. Water will be released at a rate not to exceed 250 cfs. The average phosphorus content of the released water is anticipated to be approximately 66 ppb. The maximum depth of water will be 4 feet, and the normal operating depth will be 2 feet.

The Pal-Mar Complex - Natural Storage and Treatment Area is approximately 17,143 acres of pastureland in the C-44 basin. It has been identified for use as alternative storage, nutrient removal, rehydration and habitat restoration. This land currently consists primarily of improved pasture with degraded wetlands.

C-23/24 Basins

The recommended plan includes six components within the C-23/24 Basin. These components are the C-23/24 North Reservoir, C-23/24 South Reservoir, C-23/24 STA, C-23/44 STA and Diversion Canal, Allapattah Complex - Natural Storage and Water Quality Treatment Area, and Cypress Creek Complex - Natural Storage and Water Quality Treatment Area. An operational feature of the IRLS plan known as the northern and southern diversions is accomplished via use of the construction features described for this basin. The C-23/44 STA and Diversion Canal and the Allapattah – Natural Storage and Water Quality Treatment Area are located in Martin County. The balance of the C-23/24 Basin features are located in St. Lucie and Okeechobee Counties.

The C-23/24 North Reservoir is located in St. Lucie County on the west side of C-24 between control structures G-81 and G-79 and includes a 4,398-acre above-ground reservoir with a maximum depth of 12 feet. The total storage capacity of the reservoir is approximately 48,500 acre-feet. The purpose of this component is to capture local runoff from the C-23 and C-24 basins. The pump station will be designed to provide up to 900 cfs removal rate from C-24 canal. This water can then be routed to the C-23/24 STA or returned to C-23 or C-24 when there is a need to reclaim storage capacity or meet a water supply demand. The component is designed for stormwater attenuation to the estuary to control salinity and to provide an additional source of agricultural water supply. This component is also expected to provide incidental water quality benefits by reducing loads of nutrients, pesticides, and other pollutants.

The C-23/24 South Reservoir is located in St. Lucie County north and west of C-23 between control structures G-78 and G-79 and includes a 4,155-acre above ground reservoir with a maximum depth of 12 feet. The total storage capacity of the reservoir is approximately 43,400 acre-feet. This component functions very much like the C-23/24 North reservoir. A sag culvert or inverted siphon crossing under State Highway 70 will connect the two reservoirs. The pump station will be designed to remove up to 900 cfs from the C-23 canal. The intake and discharge points on the reservoir have been separated to prevent short-circuiting, which would negatively impact incidental water quality performance. Approximately 10,560 feet of Canal C-23 will be re-routed around the reservoir levee as part of the seepage canal system. The abandoned section of the canal will be left in place as an approach to the draw down structure S-413 and as a fish refuge area.

The C-23/24 STA located in St. Lucie County and includes a 2,568-acre STA with a maximum depth of 4 feet and a normal operating depth of 2 feet. It is designed to remove 80 percent of the phosphorus from stormwater entering the C-23/24 reservoirs. The STA is located east of C-24 between control structures G-81 and G-79. This facility will be a multi-cell STA covering approximately 4 square miles. The primary discharge from the STA will be into the header canal of the North St. Lucie River Water Control District. A 250-cfs pump station will transfer water from the C-23/24 North Reservoir into the STA. It is expected that the STA will be operated to

discharge primarily into the header canal and then directed toward Ten Mile Creek. Other discharge options include C-25 and C-24.

The C-23/C-44 STA and Diversion Canal is located in Martin County and includes a 112-acre canal and a 2,300-acre STA with a maximum depth of 4 feet and a normal operating depth of 2 feet. The STA is designed to remove 80 percent of the phosphorus from stormwater diverted from the C-23 and C-24 basins. Stormwater pumped into the diversion canal from C-23 will be directed through the C-23/44 STA and then discharged through the southern portion of the diversion canal to C-44. The modeling and associated recommended plan include a 500-cfs pump station from the C-23 canal. The STA will be constructed on the Allapattah Ranch near the western boundary of this 22,000 acre property. This ranch is one of the most important and highly valued properties included in the study for natural storage, water quality improvement and habitat restoration. However, a portion of the ranch has been impacted through many years of agricultural use. The proposed STA will be located near the western boundary of the property and south of State Highway 714 on one of these highly impacted areas.

The Allapattah Complex - Natural Storage and Treatment Area, is located in Martin County and includes approximately 40,048 acres of land in the C-23 basin. Presently, stormwater quickly drains through a network of canals and into the primary canal system, which then discharges directly to the St. Lucie Estuary. By attenuating the stormwater and its associated sediment and nutrients on these lands, the size of the more expensive and maintenance-intensive reservoirs and STAs can be reduced. This land has been identified for use as alternative storage, rehydration, habitat restoration, and to provide incidental water quality treatment. This land currently consists primarily of improved pasture, degraded wetlands and some impacted native upland habitat. The large size, location along the C-23 canal, and contiguous nature of these parcels, make it the most important alternative storage area. The Allapattah Ranch, which encompasses 22,000 acres, has been extensively drained for cattle grazing and other farming practices over the years. These drained hydric soils provide an excellent opportunity. By rehydrating these lands in a very cost effective manner, large volumes of water, which currently drain off the property during the rainy season, will be attenuated on-site.

The Cypress Creek Complex - Natural Storage and Treatment Area is located in St. Lucie and Okeechobee Counties and includes 32,639 acres of primarily pastureland, along with some of the last remaining large tracts of forested wetland habitat in St. Lucie County. This land has been identified for use as alternative storage, rehydration, habitat restoration, and water quality improvements.

Northern and Southern Diversions

Today all stormwater directed into C-23 and C-24 enters the North Fork of the St. Lucie Estuary through tidal structures located near the eastern ends of the canals. The recommended plan includes construction features that direct much of the flow in the C-23 and C-24 canals into the C-23/24 north and south reservoirs. Flow from the reservoirs is then directed into the C-23/24 STA. From there, flow will move through Ten Mile Creek or C-24 and into the North Fork. This operational approach is known as the northern diversion. Existing North Fork flows and diversions to the North Fork combined come very close to achieving Natural System Model estimates of North Fork flows. In this operational mode there are significant reductions in flows directed into the River directly from C-23 or C-24.

Approximately 53,000 acre-feet per year of excess flow in the C-23 canal will be directed through the southern diversion component. Under currently proposed operational rules, 31,000 acre-feet per year may go to Lake Okeechobee via S-308, and 22,000 acre-feet per year would go to the St. Lucie Estuary via S-80. In order to achieve Natural System Model targets at C-23 (Bessey Creek), this excess flow will be diverted southward through an improved existing canal located about two miles east of the western end of the C-23 canal. This canal will connect to an STA (C-23/44 STA) to improve the quality of the stormwater prior to delivering it to a different basin (C-44). After treatment and discharge from the STA, the excess C-23 stormwater will be routed down a new canal that parallels the westernmost canal in the Troop Indiantown Drainage District. At the southern end of this canal, the stormwater will be discharged into the C-44 canal. This diversion is known as the southern diversion.

C-25 Reservoir and STA

This feature is located in St. Lucie County and includes a 741-acre above ground reservoir with a maximum depth of 8 feet and a 163-acre STA. The reservoir will capture the first 0.4 inches of runoff from both the C-25 Basin and the Ft. Pierce Farms Basin (approximately 147,225 acres). The STA was sized to treat 80 percent of the phosphorus load entering the STA from the reservoir. The total storage capacity of the reservoir and STA is approximately 5,392 acre-feet and is located north of and adjacent to C-25 at the S-99 structure. The purpose of this component is to capture and treat local runoff from the C-25 Basin and from the Ft. Pierce Farms Water Control District. Stormwater will be pumped into the reservoir from the C-25 Basin and from a new canal connection to the Ft. Pierce Farms Water Control District. The pump station will be designed to remove up to 250 cfs from the C-23 canal. Water will be released from the reservoir through the STA, where sediment, nutrient and other pollutant loads will be reduced. Water from the STA will be released into C-25, and from C-25 into the IRL. Water captured in the reservoir will also be available to augment water supply following the end of the summer rainy season. The component is designed for peak flow attenuation to the IRL; water supply benefits to legal users; and water quality benefits to reduce loading of nutrients, pesticides, and other contaminants contained in runoff presently discharged to the IRL.

Muck remediation and artificial habitat

Four locations have been targeted for muck remediation within the St. Lucie Estuary. A survey conducted September 13-16, 2000, indicates there are approximately 5,500,000 cubic yards of muck to be removed from the four identified “hot spots.” With the removal of this muck, an additional 2,650 acres of suitable substrate will be created for colonization by benthic organisms. Costs for the muck remediation are based on dredging of the muck followed by slurry pumping via pipeline to the Allapattah Natural Storage and Water Quality Treatment Area. For cost estimating purposes, it was assumed that the muck would be spread over approximately 10,000 acres of the property that currently contains pasture grass, which would assist in the eradication of exotics and reestablishment of native plants. The actual removal and disposal technique will be determined during detailed design utilizing the findings of the ongoing pilot studies.

The recommended plan also includes creating additional oyster habitat. Oysters are a vital species in achieving restoration of the estuary. They are a key indicator of the health of the system and are also very effective biofilters of fine sediments and nutrients in the water column. This habitat area is essential because it aids in the restoration process by providing a location for oyster larvae to settle and by providing habitat for other species. Six sites in the middle estuary have been identified. Each site will be approximately 15 acres in area and will include 10 acres of shell hash, 4 acres of prefabricated 2-foot diameter concrete reef balls, and one acre of artificial seagrass. A total of 90 acres of artificial habitat will be created via this means: 60 acres of oyster shell hash, 24 acres of prefabricated reef balls, and 6 acres of artificial submerged aquatic vegetation.

North Fork floodplain restoration

The North Fork of the St. Lucie River was dredged during the 1920s as a part of early drainage improvements in the region. The dredging operation cut off many oxbows present in the natural path of the river and created berms that disconnected the river channel from the adjacent floodplain. This feature includes acquisition of approximately 3,089 acres, which will receive an additional 64,500 acre-feet of flow via the northern diversion efforts.

Effects analyses for the Indian River Lagoon - South project

Eleven federally listed threatened or endangered animal species, five listed plant species, and three candidate fish species are present or potentially present in the project area. Most of these species have been previously impacted by habitat degradation due to wetland drainage, excess nutrient runoff, and a concurrent alteration of the hydroperiod. The IRLS project has the potential to greatly benefit most, if not all, of these species.

The endangered West Indian manatee is a frequent inhabitant of the St. Lucie Estuary and IRL, and is occasionally found in the C-44 canal and Lake Okeechobee. Boat-caused mortality is one

of the principal threats to the manatee. Although the lower portion of the St. Lucie Estuary downstream of Hell Gate has a relatively high concentration of boat-caused mortality, the IRLS study does not propose work in that area. Upstream of Hell Gate, the St. Lucie Estuary has a relatively low incidence of historic boat-caused mortality. Two confirmed boat-caused mortalities (1984 and 1998) occurred in the middle St. Lucie Estuary. The South Fork (upstream as far as the S-80 structure) has had seven boat-caused mortalities between 1985 and 2000. Two (1979 and 1988) were reported from the Bessey Creek area downstream of S-48, with one from the North Fork in 2000. Manatee mortality caused by water control structures and navigational locks is another significant threat to the species. In the IRLS study area, two clusters of this type of mortality have been documented in the C-44 canal. Sixteen structure-caused mortalities have been reported from the vicinity of the S-80 lock, between 1979 and 2000. Seven structure-caused mortalities occurred between 1979 and 1999 at the S-308 lock near Lake Okeechobee. In addition to the Corps' willingness to follow the standard construction precautions to protect manatees, the Service wants to ensure that any new water control structures or pumps (particularly the two intake pumps confluent with the C-44 canal) are designed to avoid any increased risk of mortality to manatees. The Corps has agreed to these design needs and is implementing a 5-year plan to retrofit all existing gates and locks.

The endangered snail kite could be found foraging in a number of native wetlands and in canals and ditches throughout the IRLS study area, and some wetland complexes within and adjacent to the study area are known to be of particular importance to the species. Wetlands in the Savannas State Preserve and the Strazzulla property (the latter being part of the species' designated critical habitat) are known to be of particular significance for breeding and/or drought refuge.

Breeding colonies of the endangered wood stork currently exist in St. Lucie County and have occurred in Martin County. Typical foraging sites include freshwater marshes and stock ponds, shallow, seasonally flooded roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, managed impoundments, and depressions in cypress heads and swamp sloughs.

South Florida contains significant support populations for recovery of the endangered red-cockaded woodpecker in the southeastern United States. Individuals have been found on the Atlantic Ridge Ecosystem Conservation And Recreation Lands project, and the Reserve Development of Regional Impact site. We expect them to also occur in other remnant pine flatwoods in the study area, but private properties have been infrequently surveyed for their presence.

The threatened Florida scrub-jay is present in oak scrub throughout the Atlantic Coastal Ridge and the Savannas State Preserve. It is also present in the project area in eastern Okeechobee County and possibly along the Holopaw-Indiantown Ridge that continues into western St. Lucie County. We are uncertain whether scrub-jays occupy scrub habitat in the Trail Ridge North, Trail Ridge, and V_2 Ranch (proposed Natural Storage and Water Quality Treatment Areas) in St. Lucie County.

Historically, the threatened Audubon's crested caracara was a common resident in Florida from northern Brevard County, south to Fort Pierce, Lake Okeechobee, and Hendry County. Today, the region of greatest abundance for this large raptor is a five-county area north and west of Lake Okeechobee. It is known to inhabit St. Lucie and Martin counties, but the exact locations of nests and foraging habitat are poorly documented.

Experimental populations of the endangered whooping crane have been released from the Three Lakes Wildlife Management Area east of Lake Kissimmee. Currently, the entire population is widely scattered throughout the central portion of the state. One radio-tagged individual has been detected in St. Lucie County. There is a good potential for them to occupy the study area in the future, assuming the population increases and the habitat is still present.

The threatened bald eagle could be encountered during construction, therefore, the Service expects implementation of the standard construction precautions to avoid adverse effect on this species.

The threatened eastern indigo snake could be encountered during construction, therefore implementation of the standard construction practices to avoid adverse effect on the species is expected.

The endangered Florida panther have not been confirmed as occupying the study area. The core population is southwest of Lake Okeechobee. However, if this population increases in the future, it is possible that the panther's range may spread north of Lake Okeechobee and into the forested areas of western St. Lucie and Martin counties.

There are four endangered upland plant species that have been found in scrub habitat in the eastern portion of the study area on the Atlantic Coastal Ridge (Coile 2000). They may also be present in isolated scrub pockets not yet surveyed for plants. They are not likely to be affected by construction or operation and maintenance of reservoirs or STAs. However, when site visits are conducted for individual project components, any scrub habitat encountered should be surveyed for the following four plants. Tiny polygala is a milkwort found in sand pockets in pine rocklands, open sand pine scrub, slash pine, high pine, sandhills, and well-drained coastal spoil. Four-petal pawpaw is found in coastal sand pine and scrub oak. Fragrant prickly-apple is a tree cactus found in sand pine scrub, scrubby flatwoods, and coastal hammock. Florida perforate cladonia, commonly called reindeer lichen, is found in high, well-drained sands of rosemary scrub.

An additional listed plant species, the threatened Johnson's seagrass, is present in the IRL and lower St. Lucie Estuary near Hell Gate. It can be found along the Atlantic coast from the town of Sebastian to Key Biscayne. An additional endangered animal species, the Atlantic green sea turtle, is also present in the IRL and lower St. Lucie Estuary. Management and recovery of Johnson's seagrass, and of the Atlantic green sea turtle when in the water, is under the

jurisdiction of the NOAA-Fisheries. Therefore, the Corps should initiate consultation with the NOAA-Fisheries to address any potential effects on this species.

There are three estuarine fish species under consideration by the NOAA-Fisheries for Federal listing that may be present in the study area: Atlantic sturgeon, mangrove rivulus, and opossum pipefish. The Corps should initiate consultation with the NOAA-Fisheries to address any of their concerns regarding these fish species.

Existing and future habitat for listed species

The following discussion is based on project footprints that were published in the Corps Final Feasibility Report dated August 2002. These footprints include canals, pump stations and other structures. Project footprints may change locations, but we anticipate that the acres of various components will remain similar (*i.e.*, if one parcel proves to be unavailable, another parcel will replace it in the project plan). Of course, differing land covers may require modifications to this analysis.

Scrub species

Scrub habitat was assumed to be potential habitat for the following species: Florida scrub-jay, tiny polygala, four-petal pawpaw, fragrant prickly-apple, and Florida perforate cladonia (separate analyses were done for two other potential scrub inhabitants - eastern indigo snake and red-cockaded woodpecker). We calculated the amount of potential scrub habitat in the project area using the District's digital land use data and associated FLUCCS 3 codes. Table 07-1 shows the relative acres of scrub habitat in the project area and natural areas.

Table 07-1. Acres of scrub habitat in the Indian River Lagoon - South project area and natural areas.

Level 3 FLUCCS Code	Code Description	Project Area Acres	Natural Area Acres
322	coastal scrub	643	-
412	longleaf pine - xeric oak	865	617
413	sand pine	3,289	440
414	pine - mesic oak	365	24
421	xeric oak	308	-
432	sand live oak	244	-
	Total	5,714	1,081

In the entire project area there are 5,714 acres of scrub-type habitat. Review of the land use data indicated that there are 1,081 acres of scrub habitat within the natural area components and no scrub areas within the other project components (*i.e.*, reservoirs and STAs). Of this total, 1,032 acres of scrub habitat are inside of the Trail Ridge Natural Area Complex footprint. The remainder is within the North Fork Buffer Parcel.

Following project completion the amount of scrub-type habitats in the natural areas will still be 1,081 acres. The quality of this habitat will likely be better due to public acquisition and better management for exotics and fire.

Wood Stork

We calculated the acres of wood stork foraging habitat in the IRLS project area, natural areas, and reservoirs and STAs using the FLUCCS 3 codes in Table 07-2. In the entire project area there are 248,190 acres of wood stork foraging habitat. There are 75,622 acres of potential wood stork habitat within the natural area components presently.

We assumed that areas that are currently wetlands (including reservoirs and canals) on the Natural Areas would remain wetlands after restoration. That total is 24,904 acres. We also calculated that approximately 29,419 acres of historic hydric soils would be rehydrated and then provide additional wood stork habitat. Much of this land is now unimproved pasture (and is currently categorized as wood stork habitat), and some of it is improved pasture (and currently categorized as lower quality wood stork habitat). We cannot easily determine which type of pasture habitat would be converted to wetlands, nor whether or not these post-restoration wetlands would be, for example, wet prairie or freshwater marsh or wetland hardwoods. As such, we lumped all rehydrated hydric soils (*i.e.*, restored wetlands) as suitable for wood storks. Therefore, the total, post-restoration, high-quality wood stork habitat in the natural areas would be 54,323 acres (*i.e.*, the current wetlands plus the restored wetlands). That would result in a loss of 21,299 acres of existing habitat primarily due to inclusion of 43,230 acres of improved pasture as current stork habitat. We presume that some of this will be converted to wetlands and the remainder will be uplands. The amount of upland habitat is difficult to predict at this time, due to as yet undefined management practices. Historically, these upland areas were pine flatwoods and as such would have been unsuitable for wood storks.

Table 07-2. Acres of wood stork habitat in the Indian River Lagoon - South project area, natural areas, and reservoirs and stormwater treatment areas (STAs).

Level 3 and 4 FLUCCS Code	Code Description	Project Area Acres	Natural Area Acres	Reservoir and STA Acres
182	Golf Courses	5,652	-	-
184	Marinas, Fish Camps	318	-	-
211	Improved Pasture	114,121	43,230	-
212	Unimproved Pasture	23,212	6,421	133
213	Woodland Pasture	1,025	23	0
214	Row Crops	13,039	464	-
215	Field Crops	1,964	143	-
2156	Sugar Cane	289	-	-
221	Citrus (2 percent of area)	3,833	-	364
254	Aquaculture	420	-	-
510	Canals/Streams	10,292	709	0
524	Lakes < 10 Acres	389	38	1
534	Reservoirs < 10 Acres	2,993	-	8
611	Bay Swamp	315	63	-
612	Mangrove Swamp	8,082	188	43
615	Stream and Bottomland	3,800	1,968	0
616	Inland Pond and Sloughs	7,251	2,842	0
617	Mixed Wetland Hardwoods	2,406	862	0
620	Wetland Coniferous Forests	n/a	1,551	3
621	Cypress	5,702	-	29
624	Cypress-Pine-Cabbage Palm	446	365	-
630	Wetland Forested Mixed	2,008	854	7
641	Freshwater Marsh	24,536	9,118	64
643	Wet Prairie	15,221	6,711	100
644	Emergent Aquatic Vegetation	876	72	-
	Total	248,190	75,622	752

According to the Service's database there were 6 wood stork rookeries near or within the project area boundary (within 18.6 miles of a component or the boundary line). No nests were coincident with reservoir or STA footprints. Two rookeries were coincident within the Cypress Creek and V_2 Ranch natural area footprints. We anticipate that the restoration of wetlands and associated canopy species (*i.e.*, cypress, palms, etc) on the natural areas would lead to the formation of additional colonies within those natural areas. The number of additional colonies would be difficult to predict.

Additionally, there are presently 752 acres of wood stork habitat within the other project components (*i.e.*, reservoirs and STAs; this includes two percent of citrus lands; see Table 07-2). This habitat will be converted to, on average, deeper aquatic habitat and therefore is considered a complete loss of habitat for wood stork. In reality, some of this may be accessible to wood storks however, as with bald eagle and snail kite, we are unable at this time to predict that quality or extent of habitat for wood storks in the STAs or reservoirs. The following is a summary of the potential wood stork habitats in IRLS reservoirs and STAs.

The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning.

Audubon's crested caracara

We calculated the acres of potential caracara habitat in the project area, natural areas, and reservoirs and STAs using the FLUCCS 3 codes shown in Table 07-3 (the following codes that may be suitable for caracaras were not present: 190, 210, 220, 242, 260, 320, 441, 442, 443, 423, 429, 430, 431, 433, 435, 439, and 640).

In the entire project area there are 260,096 acres of potential caracara habitat. There are 75,050 acres of caracara habitat within the natural area components presently. This is expected to remain as caracara habitat (although land uses will change) in the natural areas after project completion. Additionally, there are presently 19,668 acres of caracara habitat within the other project components (*i.e.*, reservoirs and STAs). This habitat will be converted to deeper aquatic habitat and therefore, is considered a loss of habitat for caracaras.

Table 07-3. Acres of caracara habitat in the Indian River Lagoon - South project area, natural areas, and reservoir and stormwater treatment areas (STAs).

Level 3 and 4 FLUCCS Code	Code Description	Project Area Acres	Natural Area Acres	Reservoir and STA Acres
211	Improved Pasture	114,121	43,230	425
212	Unimproved Pasture	23,212	6,421	110
213	Woodland Pasture	1,025	23	-
214	Row Crops	13,039	464	130
215	Field Crops	1,964	143	-
2156	Sugar Cane	289	-	-
221	Citrus	18,194	-	18,194
251	Horse Farms	767	90	-
252	Dairies	2,220	17	-
254	Aquaculture	420	1	-
259	Other	31	5	-
261	Fallow Cropland	5,235	338	6
310	Herbaceous Rangeland	3,782	1,458	6
321	Palmetto Prairies	2,173	233	-
329	Other Shrub and Brush	4,167	430	14
330	Mixed Rangeland	3,616	681	184
421	Xeric Oak	308	-	-
425	Temperate Hardwoods	5,445	665	132
426	Tropical Hardwoods	2,047	-	-
427	Live Oak	398	29	127
428	Cabbage Palm	103	-	-
432	Sand Live Oak	244	-	-
434	Hardwood Conifer Mix	8,086	1,779	135
437	Australian Pine	68	7	-
438	Mixed Hardwoods	1,689	-	-
616	Inland Pond and Sloughs	7,251	2,842	-
624	Cypress-Pine-Cabbage Palm	445	365	-
641	Freshwater Marsh	24,536	9,118	123
643	Wet Prairie	15,221	6,711	82
	Total	260,096	75,050	19,668

According to the Service's database, there were 31 caracara observations and one nest near or within the project area boundary (within a component footprint or within 6,600 feet of a component's boundary line). No nests were coincident with reservoir or STA footprints. Eighteen observations were coincident within the natural areas. One nest was coincident within the Allapattah natural area footprint.

We assumed that areas that are currently wetlands would remain wetlands after restoration. We also calculated that approximately 29,419 acres of historic hydric soils would be rehydrated and would then be classified as wetlands and be usable caracara habitat. We assumed that native upland cover types (*i.e.*, rangeland and forests) would not change following hydroperiod restoration.

It is likely that intensive agricultural cover types (FLUCCS codes 211, 212, 213, and 261) that currently serve as potential caracara habitat could be converted to deep wetlands or forested habitat (not included above) as a result of restoration (*i.e.*, a loss of caracara habitat). It is also possible that it could be converted to more natural rangeland habitat (*i.e.*, an increase in quality of caracara habitat). However, at this time, it is difficult to predict final land covers following restoration, and then to estimate potential caracara habitat losses or gains. We have concluded that the restoration action on the natural areas is a net positive action; therefore, there would be no loss to caracara as long as nest trees are not destroyed. We believe that the management of the property can safely restore the hydroperiod without removing active (or recently active) nest trees. Benefits are not possible to quantify now, but may be within 5 years after restoration activities begin to effect change.

The Service's *Habitat Management Guidelines For Audubon's Crested Caracara In Central and Southern Florida* should be consulted during project planning.

Red-cockaded Woodpecker

We calculated the acres of potential red-cockaded woodpecker habitat in the project area using the following FLUCCS 3 codes (see Table 07-4; no acres of 423, 441, or 622 are present in project area). In the entire project area there are 73,490 acres of potential red-cockaded woodpecker habitat. There are 15,159 acres of red-cockaded woodpecker habitat within the natural area components presently that will remain red-cockaded woodpecker habitat after project completion. Additionally, there are presently 501 acres of red-cockaded woodpecker habitat within the other project components (*i.e.*, reservoirs and STAs). This habitat will be converted to deeper aquatic habitat and therefore, is considered a loss of habitat for red-cockaded woodpecker.

Table 07-4. Acres of red-cockaded woodpecker habitat in the Indian River Lagoon - South project area, natural areas, and reservoirs and stormwater treatment areas (STAs).

Level 3 FLUCCS Code	Code Description	Project Area Acres	Natural Area Acres	Reservoir and STA Acres
411	Pine Flatwoods	58,426	11,031	143
412	Longleaf Pine Xeric Oak	865	617	
413	Sand Pine	3,289	429	
414	Pine-mesic Oak	365	24	21
419	Other Forest	6		
434	Hardwood-conifer mixed	8,086	1,779	135
624	Cypress-pine-cabbage Palm	445	366	2
630	Wetland Forest Mix	2,008	913	200
	Total	73,490	15,159	358

As with scrub, no impact to existing upland communities is expected on the natural areas. One might expect that drier communities could be impacted by rehydration; however, for canopy species, we do not believe this to be the case because any drained areas that could have been invaded by upland species were maintained as intensive agriculture. Therefore, the post-project condition would be the same or an increase in quality of habitat due to public acquisition and better management. This potential increase in quality is difficult to quantify at this time.

Everglade snail kite

We calculated the acres of snail kite habitat in the project area using the FLUCCS 3 codes in Table 07-5. In the entire project area there are 76,540 acres of snail kite habitat. There are 24,792 acres of snail kite habitat within the natural area components presently. We expect these will remain snail kite habitat after project completion. There are also 29,419 yet to be restored wetland acres that when added to the existing 24,792 acres yields 54,211 acres of potential snail kite habitat within the natural areas. We anticipate that all these wetland will support apple snail populations. Additionally, there are presently 256 acres of snail kite habitat within the other project components (*i.e.*, reservoirs and STAs). This habitat will be converted to deeper aquatic habitat; however, the amplitude and timing of water elevations may not be conducive to the establishment of apple snail populations and, therefore, is considered a complete loss of habitat for snail kite.

Table 07-5. Acres of snail kite habitat in the Indian River Lagoon - South project area, natural areas, and reservoirs and stormwater treatment areas (STAs).

Level 3 FLUCCS Code	Code Description	Project Area Acres	Natural Area Acres	Reservoir and STA Acres
510	Canals/Streams	10,292	709	-
524	Lakes < 10 Acres	389	-	1
534	Reservoirs < 10 Acres	2,993	38	8
611	Bay Swamp	315	63	43
615	Stream and Bottomland	3,800	1,968	-
616	Inland Pond and Sloughs	7,251	2,842	-
617	Mixed Wetland Hardwoods	2,406	862	-
621	Cypress	5,702	1,551	3
630	Wetland Forested Mixed	2,008	854	29
641	Freshwater Marsh	24,536	9,118	7
643	Wet Prairie	15,224	6,711	67
644	Emergent Aquatic Vegetation	875	72	98
645	Submerged Aquatic Vegetation	749	4	-
	Total	76,540	24,792	256

Eastern Indigo Snake

Due to the widespread distribution and vast array of habitats that eastern indigo snake will utilize, it was easier to calculate the habitat utilization using FLUCCS 3 codes that indicated the habitats that eastern indigo snake would not use. They were: 181, 500, 510, 520, 521, 522, 523, 524, 530, 531, 532, 533, 534, 540, 541, 542, 642, 644, 645, 650, 651, 654, 710, 911, and the entire 800 series. Any value associated with the perimeters of these cover types would be covered by counting the adjacent types as habitat. The total acre of non-eastern indigo snake usable habitat in the project area was 73,648 acres of the total 728,077 IRLS project area (or roughly 10 percent). Therefore, the total potential eastern indigo snake habitat in the entire project area was 654,429 acres. In the natural areas, we assumed that all acres are currently eastern indigo snake habitat and that would not change upon rehydration. Even though the restoration of a freshwater marsh could force some individuals to move into a drier area, that would not be considered a loss of habitat because indigo snakes are good swimmers and regularly use these wetland types. It is also possible that the improved management of the natural areas would improve the quality of the remaining eastern indigo snake habitat and that would offset a potential loss in spatial extent. Therefore, we expect no change in eastern indigo snake habitat on the natural areas following project completion. Existing habitat in the natural areas is 97,820 acres.

We assumed that all of the reservoir and STA footprints, because they were mostly intensive agriculture (citrus mostly), was eastern indigo snake habitat. In fact, only approximately 25 acres was coded as water too deep for indigo snakes. This does not include the numerous canals traversing the footprints which we felt were not easily measurable or identifiable as eastern indigo snake habitat. Therefore, a slightly more accurate assessment option to assuming all reservoir and STA footprints to be eastern indigo snake habitat, would be to subtract 1 percent of the total acres as unusable for eastern indigo snake. Therefore, of the total 21,000 acres of reservoir and STA footprint 99 percent or 20,790 acres is currently eastern indigo snake habitat. The Service has decided that STAs would be considered habitat for indigo snakes; therefore only 13,195 acres of reservoirs would be lost to this species as a result of project construction. The Service's *Standard Protection Measures for the eastern Indigo Snake* should be implemented during project construction.

Florida panther

This project is partially within the panther Expansion Area; the C-44 Canal forms the southern boundary of the Expansion Area east of Lake Okeechobee. There are approximately 19,740 acres (of the total 97,820 acres) of IRL-S project natural areas immediately south of C-44 (*i.e.*, outside of the Expansion Area). However, for the purpose of this discussion we will include these acres as being available to panthers because they may swim across the C-44 Canal. All other project features are within the Expansion Area. At this time, we have no evidence that panthers occupy the study area. The core population is southwest of Lake Okeechobee. If this population increases in the future, it is possible that the panthers could move into the forested areas of western St. Lucie and Martin counties. Table 07-6 shows the amount and quality of panther habitat (based on FLUCCS codes) currently within the study area and project features. Currently, there are 502,503 acres of potential panther habitat in the study area. There are 91,471 acres of potential panther habitat within the natural areas, and 19,320 acres of potential panther habitat within the reservoirs and STAs.

Table 07-6. Available acres and quality of panther habitat within the Indian River Lagoon - South study area and project features.

Feature	Low Quality	Medium Quality	High Quality	Totals
Entire Project Area	207,362	152,038	143,103	502,503
Reservoirs and STAs	18,200	337	783	19,320
Natural Areas	607	52,472	38,392	91,471

We anticipate that the total potential panther habitat within the reservoirs and STAs (19,320 acres of mostly low-quality panther habitat) would be lost. For the IRL-S natural areas, since the intent is to re-establish the native wetland and upland communities, we have assigned these areas

(97,820 acres total) as high-quality potential panther habitat after the project is completed. Therefore, within the natural areas, we predict that this project will maintain the existing 38,392 acres of high quality panther habitat, and improve the remainder of the acres (for low, medium, and non-panther habitat) to high-quality habitat (a 59,428-acre improvement).

The removal of these 97,820 acres from tax rolls and the subsequent elimination of residential development would likely benefit panthers.

This project is also partially within the panther Core, Other area (*i.e.*, south of the C-44 Canal). The Pal Mar Natural Area Complex includes approximately 12,615 acres (of the total project 97,820 acres) on which wetlands will be restored by the filling of ditches, exotic plant control, and fire management. There are approximately 4,15 acres of high quality habitat and 8,500 acres of low quality habitat. Uplands will be restored to pine flatwoods. After restoration, we anticipate that there will be 6,756 restored wetland acres added to the existing wetlands.

West Indian manatee

We have mortality data for the project area in the larger canals (C-44, C-23, C-24) and St. Lucie Estuary and IRL. We do not anticipate any additional take as a result from this project since any new or modified structure would have manatee protection devices incorporated within the design. Benefits to manatees as a result of this project should be cleaner water and better seagrass habitat. The effects of cleaner water on manatees can not be easily quantified. Better water quality could also reduce incidence of diseases (either through the direct reduction of waterborne pathogens, or the reduction in chemicals like pesticides which may suppress immunological systems). An increase in seagrass spatial extent could also benefit manatees. At this time, it is difficult to predict the increase in spatial extent of seagrass beds as a result of this project. However, the Corps targeted (as reported in their EIS) a 920-acre increase of seagrass beds to depths of 5.6 feet. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during project construction.

Bald eagle

There are 75,476 acres of potential bald eagle foraging habitat (open water and wetlands) in the project area. According to the Service's database there were 31 bald eagle nests near or within the project area boundary (approximately within 33,000 feet of a feature or the boundary line). No nests were coincident with reservoir or STA footprints. Five nests were coincident with natural area footprints. Therefore, we expect no harm, harassment, or take of bald eagle nests or foraging habitat as a result of this project. The spatial extent of restored wetlands within the natural areas should increase by 29,419 acres; therefore, the amount of bald eagle foraging habitat in the natural areas would increase from 24,792 acres of wetlands to 54,211 acres. The creation of STAs and reservoirs may provide foraging habitat for bald eagles; however at this time we can not estimate the potential increase in quality of that foraging habitat. Since we do

not know at this time that open water components will be included in the STAs, these areas will not be tallied as new foraging habitat for this report.

For new electrical lines that may need to be installed for this project, the publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution. The Service's *Habitat Management Guidelines for the Bald Eagle in the Southeast Region* should be consulted during project planning if the project will affect eagle nests.

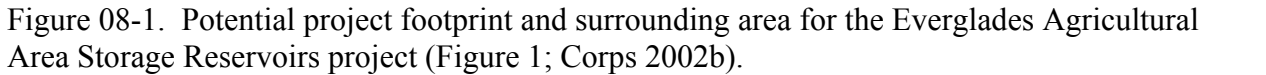
Sea turtle species

No effect on sea turtle nesting is expected to result from this project. An increase in seagrass beds would produce an increase in potential forage and therefore, may benefit the Atlantic green sea turtle. The extent of this benefit is difficult to quantify. However, the Corps targeted (as reported in their EIS) a 920-acre increase of seagrass beds to depths of 5.6 feet.

Everglades Agricultural Area Storage Reservoir project description

For the purposes of this report, Phase 1 and Phase 2 of the EAA Storage Reservoir Project (EAA Project) will be discussed and the combined potential effects on federally listed species will be analyzed. The EAA Project originally envisioned in the Restudy consisted of constructing three 20,000 acre above ground reservoirs (60,000 acres total) with increased conveyance in associated canals. Two of the reservoirs would be constructed during Phase 1 and the third reservoir during Phase 2. The first reservoir would receive water from the Everglades Agricultural Area (EAA) and be used to meet irrigation demands only. The second reservoir would receive water from Lake Okeechobee to meet environmental water demands as a priority. In Phase 2, the third reservoir would receive water from Phase 1 overflows and Lake Okeechobee releases to meet environmental demands as a priority. However, exact configuration of the components will be determined through more detailed planning and design.

Phase 1 of the EAA Project required 40,000 acres of land. An increase in land availability for the EAA Project may lead to a revision in the Restudy conceptual plan. According to the Phase 1 EAA Project Draft Environmental Existing Conditions Report prepared with the assistance of Kimley-Horn and Associates, Inc (Corps 2003a), the current EAA Project Phase 1 potential footprint encompasses approximately 53,654 acres in the EAA. The potential footprint is apportioned into three areas referred to as Component A (35,526 acres), B (9,256 acres), and C (8,872 acres) (Fig. 08-1). According to the real estate plan section of the Phase 1 PMP, the three Components were primarily part of the Talisman and Woerner land acquisitions (Corps 2002b). Components A and C are located west of US Highway 27 and the North New River Canal in southwestern Palm Beach County and Hendry County. Component B is located east of the highway and canal. The Talisman properties are located primarily in Components A and C and are used for sugar cane production. The Woerner properties, located in Component B and the northeastern portion of Component A, are used to grow sod and row crops. At the present time, the Talisman and Woerner properties are being leased and farmed. Existing canals associated with the EAA Project include the Miami, Bolles, Cross, and North New River Canals. Reservoirs will be designed and evaluated within these areas or at an alternate location to be determined during the plan formulation and evaluation phase of this study. The results will be presented in the PIR.



As presented in the Restudy, 60,000 acres of land would be required to construct the three 20,000 acre reservoirs. At this time, the existing potential EAA Project footprint (approximately 53,654 acres) is of insufficient size to accommodate both the Phase 1 reservoirs (40,000 acres

total) and the Phase 2 reservoir (20,000 acres). An additional 6,346 acres of land is required. This discrepancy has not yet been addressed. Possibilities for addressing this land deficit may include: (1) acquiring 6,346 acres of land contiguous to the existing potential project footprint; (2) acquiring 20,000 acres of similar land in the vicinity but not necessarily contiguous to the existing potential project footprint; (3) redesigning the Phase 2 reservoir upon further consideration and design of Phase 1; or (4) designing the Phase 1 reservoirs so that Phase 2 of the project is no longer required. During the EAA Phase 1 PIR process, the PDT will reevaluate the optimum number, size, depth, and location of the reservoirs. Current discussion has centered around perhaps designing the reservoirs deeper and with a smaller footprint. For the purposes of this report, the Phase 2 reservoir footprint is assumed to be 20,000 acres and located on land of similar character contiguous to, or in the vicinity of, the existing potential EAA Project footprint.

Natural areas adjacent to Components A, B, and C are part of the Everglades Protection Area and include Holey Land Wildlife Management Area, Rotenberger Wildlife Management Area, and WCA 2 to the south and east. Fish and wildlife resources for these areas are managed by the FWC. All three natural areas discharge water south into northern WCA 3A. Management of water levels in the WCAs is the responsibility of the District in accordance with regulation schedules set by the Corps. The Loxahatchee NWR, also known as WCA 1, is adjacent to the eastern boundary of the EAA but is not directly adjacent to the EAA Project existing potential footprint.

STAs are constructed wetlands designed to incorporate biological processes to reduce the nutrient load (phosphorus) entering the Everglades Protection Area (District 2002). STAs are constructed or planned adjacent to the EAA Project as part of the Everglades Construction Project. STA 3/4 is currently under construction and located at the southeastern corner of Compartment A, east of Holey Land Wildlife Management Area. Most environmental releases from the EAA Project destined for treatment are expected to pass through STA 3/4. STA 2, located on the eastern side of Compartment B, and STAs 5 and 6, located on the western side of Rotenberger Wildlife Management Area, may also be used to treat some releases from the EAA Project.

The current goals and objectives of the EAA Project Phase 1 are presented in the PMP (Section 3.2) as follows:

- a. reduction of the Lake Okeechobee regulatory releases to the estuaries and backpumping from the EAA into Lake Okeechobee by sending water to the south and into the reservoirs;
- b. improved environmental releases through the storage of water and release to the Everglades during the dry season demand;

- c. flow equalization and optimization of treatment performance of STA 2, STA 3/4, STA 5, and STA 6 by capturing peak storm event discharges within the reservoirs for slow release to the STAs; and
- d. improved flood control and regional water supply for the agricultural community currently served by the EAA canals and other areas served by Lake Okeechobee.

The goals and objectives for Phase 2 of the EAA Project are anticipated to be similar.

Pending further evaluation by the PDT and for the purposes of this report, configuration of the Phase 1 and Phase 2 reservoirs and canals as envisioned in the Restudy will be used to determine potential effects on threatened and endangered species:

- a. Three 20,000 acre reservoirs, up to six feet deep, storing a total of 360,000 acre/feet of water (120,000 acre/feet each);
- b. Three inflow pumps from the Miami Canal (one pump to each reservoir);
- c. Three inflow pumps from the North New River Canal (one pump to each reservoir);
- d. Three outflow structures to the Miami Canal (one structure to each reservoir);
- e. Three outflow structures to the North New River Canal (one structure to each reservoir);
- f. One outflow structure to STA 3/4 (in one reservoir);
- g. Increased conveyance of approximately 20 miles of the Miami Canal in the northern reaches of the EAA (200 percent increase);
- h. Increased conveyance of approximately 18 miles of the North New River Canal in the northern reaches of the EAA (200 percent increase); and
- i. Increased conveyance of approximately 16 miles of the Bolles and Cross Canals.

According to the Restudy, a total of approximately 87.3 miles of levees would be associated with construction of the reservoirs. The levees are anticipated to be approximately 100 feet wide and 14 feet high (Rob Tucker, Corps, personal communication 2003). This makes a total levee footprint of approximately 1,058 acres. Canal conveyance construction may be implemented prior to reservoir construction in order for the transmission system to be in place.

According to the Phase 1 PMP, construction of the canal conveyance is estimated to take approximately two years and construction of the two Phase 1 reservoirs is estimated at five

years. For the purposes of this report, Phase 2 reservoir construction is also anticipated to take no longer than 5 years.

Initial effects analysis for the EAA Storage Reservoirs project

In a letter dated January 2, 2003, the Service concurred with the list of federally listed species and designated critical habitats for Phase 1 of the EAA Project identified in a December 4, 2002 letter from the Corps. The Service letter partially fulfilled the requirements of the Service under Section 7 of the ESA. Federally listed species that could potentially be affected by the EAA Project include the endangered West Indian manatee, Florida panther, Everglade snail kite and its critical habitat, wood stork, and the threatened Audubon's crested caracara, southern bald eagle, and eastern indigo snake. Additionally, the endangered Okeechobee gourd has occasionally occurred along canals downstream from this species' primary range in Lake Okeechobee and could occur in the EAA Project footprint. However, it is likely that these canal populations are ephemeral and of discountable importance to the species. Therefore, we will not analyze disturbance or loss of potential habitat resulting from the EAA Project for this species.

Regional effects on the listed species above are discussed separately. Based on available information, there are no confirmed nest sites, rookeries, or den sites for listed species within the existing potential EAA Project footprint. Information regarding listed species in the potential footprint of the EAA Project were gathered from various references, documents, and studies of wildlife including the MSRP (Service 1999a), Loxahatchee NWR Comprehensive Conservation Plan (Service 2000a), FWC Wildlife Observation Database (1993) and Listed Wildlife Species Distribution data set, the Florida Natural Areas's Inventory Element Occurrences database (June 2002), a report for FLO-SUN Incorporated entitled "Wildlife of the Everglades Agricultural Area" (Lodge 1996), and Service staff. A wildlife survey within the EAA is currently being conducted by Frank Mazotti of the University of Florida, however the completion date is unknown at this time.

West Indian manatee

The West Indian manatee may use canals associated with the EAA Project and may be present at reservoir structure construction sites. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during project construction.

Harm:

- a. Mortality or disturbance could result from construction of six inflow pumps and seven outflow structures associated with the reservoirs - five years. The Service suggests measures be taken to ensure minimal or no disturbance to manatees during construction of reservoir structures (such as erecting exclusion barriers);

- b. Mortality or disturbance could result from machinery and construction activities used to expand 54 miles of canal (Miami, North New River, Bolles, and Cross Canals) during the two years of construction. The Service suggests measures be taken to ensure minimal or no disturbance to manatees during canal construction activities (such as erecting exclusion barriers); and
- c. Mortality could result due to crushing and/or impingement during operation of inflow/outflow structures (opening and closing). The Service recommends using exclosures or other measures to prevent proximity of manatees to structures.

Florida panther

Florida panthers may range across the EAA when traveling; however, no known foraging or breeding activities have been recorded within the EAA Project potential footprint. All of the approximately 40,616 acres of the EAA Project potential footprint falls within the Conservation Lands Zone of the CERP Landscape Level Project Planning/Siting Map for Panther Conservation.

Potential Harm: Due to hydrological changes on 60,000 acres of agriculture or other upland converted to deep water reservoir, panthers may be forced to travel greater distances to cross or skirt portions of the EAA. When constructed, the approximately 40,000 acres of reservoirs will possess zero value for panther habitat (reservoirs - FLUCCS 530). Depending on where the reservoirs are located within the approximately 49,616 acre EAA Project potential footprint, up to 599 high value panther habitat acres (vegetated non-forested wetlands - FLUCCS 640) and/or up to 40,000 acres of the 48,092 low value panther habitat acres (agricultural row crops, field crops, and sugar cane - FLUCCS 214, 215, and 2156) may be affected. The remaining 925 acres have zero value for panther habitat (streams and waterways - FLUCCS 510).

Everglade snail kite

The Everglades snail kite is not known to forage or breed within the potential project footprint. Habitat within the EAA Project potential footprint is not conducive to maintaining populations of apple snails, the main prey of snail kites. Critical habitat for the Everglades snail kite is located in natural areas potentially affected by the EAA Project (including portions of Lake Okeechobee to the north and the Everglades Protection Area to the south and east).

Harm: None expected.

Benefits: Approximately 64 acres (6-foot edge along 87.3 miles) of new snail kite foraging habitat will be created along the reservoir edges.

Wood stork

Wood stork rookeries have not been observed in the potential project footprint. However, three wood stork rookeries may be present within the 18.6-mile CFA (depending on location of reservoirs) as follows: one rookery located in the Loxahatchee NWR to the east, one rookery in WCA 2B to the southeast, and one rookery in eastern WCA 3A North (Rescue Strand) to the south. In addition to wetland areas within the EAA Project potential footprint, potential foraging area for wood storks and other wading birds occurs on agricultural land under certain conditions, such as during the wet season and flooding of fields.

During the planning process the Service's *Habitat Management Guidelines for the Wood Stork in the Southeastern Region*, U.S. Fish and Wildlife Service *Supplemental Habitat Management Guidelines for the Wood Stork In The South Florida Ecological Services Consultation Area* and *Wood Stork Standard Operating Procedures for Endangered Species* should be consulted.

Harm:

- a. Possible loss of 60,000 acres of foraging habitat (could include 1,942 acres or more of wetlands) due to hydrological changes of 60,000 acres agriculture/upland/wetland converted to deep water reservoir (minus open water areas currently existing within the actual reservoir footprint, which is yet to be determined);
- b. Construction activities may disturb adjacent natural areas (see above) suitable for foraging - 5 years;
- c. Possible incursion of construction activities and loss of feeding grounds within 18.6-mile CFAs of rookeries (depending upon location of reservoir); and
- d. High levels of present or mobilized contaminants could result in potential harm to individuals feeding in the area. The potential for harmful levels of contaminants in reservoir waters will depend upon analysis of contaminant and Hazardous, Toxic, and Radioactive Waste results and the exact placement of reservoirs. Of particular concern would be possible high levels and/or mobilization of contaminants in reservoir waters upon first flooding, as reservoirs dry down, and upon reflooding. Contaminants of concern include mercury and other metals, ammonia, petroleum hydrocarbons, polynuclear aromatic hydrocarbons, polychlorinated biphenyls, organophosphates, organochlorines, and persistent herbicides. Every effort should be made to locate reservoirs in areas with the least potential for presence or mobilization of harmful contaminants. Remediation efforts will be analyzed.

Audubon's crested caracara

Although Audubon's crested caracara may range and forage in the potential EAA Project footprint, no caracara nests are present in or near the area. The greatest abundance of caracaras are in counties to the north and west of Lake Okeechobee. The Service's *Habitat Management Guidelines For Audubon's Crested Caracara In Central and Southern Florida* should be consulted during project planning.

Harm: Minimal loss of upland feeding grounds. No harm expected.

Bald eagle

No bald eagle nests have been reported within the potential footprint of the EAA Project. For new electrical lines near open water that may need to be installed for this project, the publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

Harm: None expected.

Benefits: None expected. New reservoirs will not be considered foraging habitat because suitable perches will not be present.

Eastern indigo snake

Potential breeding and foraging habitat exists for the eastern indigo snake in upland, wetland, and agricultural areas within the EAA Project potential footprint.

Harm:

- a. Loss of 60,000 acres of agriculture/upland/wetland habitat suitable for breeding and foraging (minus open water areas currently existing within the actual reservoir footprint, which is yet to be determined);
- b. Possible mortality due to excavation and construction activities. For purposes of this report, we will assume that construction is limited to the approximately 1,058 acres of the new levees. Additional harm could occur if clearing or other construction activity occurs within the reservoir interiors. The Service recommends techniques be used to reduce effects to eastern indigo snake burrows during construction activities; and
- c. Possible mortality of individuals on levee and/or construction roads.

Benefit: Approximately 1,058 acres of new levee habitat will be created. The Service recommends minimizing disturbances along sides of levees (such as excavation or low cutting maintenance activities).

Coordination with the Corps and The District for the EAA Storage Reservoirs project

This project description and effects analysis was coordinated with the Corps and the District project managers.

November 1, 2002. Kickoff Meeting of the PDT.

February 11, 2003. PMP send to PDT for review and next meeting of the PDT set for March 13, 2003.

March 10, 2003. PDT meeting scheduled for March 13, 2003 to discuss the PMP cancelled indefinitely due to water quality considerations that are outside the control of the project.

Section 7 Consultation

December 4, 2002. Corps letter regarding threatened and endangered species.

January 2, 2003. Service response letter.

10 Big Cypress/L-28 Interceptor Modifications

Big Cypress/L-28 Interceptor Modifications project description

This project includes modification of levees and canals, water control structures, pumps, and STAs with a total storage capacity of 7,600 acre-feet located within and adjacent to the Miccosukee and Seminole Indian Reservations in Collier and Hendry Counties. Figure 10-1 shows the general location of the project. The initial design of the STAs assumed a total of 1,900 acres with the water level fluctuating up to 4 feet above grade. Conceptual sizes of the STAs were based on interim phosphorus concentration targets in the conceptual plan for the Everglades Construction Project. The final size, depth and configuration of this facility, including the STAs, will be determined through more detailed planning and design. Two STAs are proposed, an 1,100 acre STA located to the north of the West Feeder Canal and an 800 acre STA located to the west of North Feeder Canal (Fig. 10-2). Design of the STAs will be based on water quality criteria of the Seminole Tribe and criteria applicable to the Big Cypress National Preserve (BCNP), as appropriate.

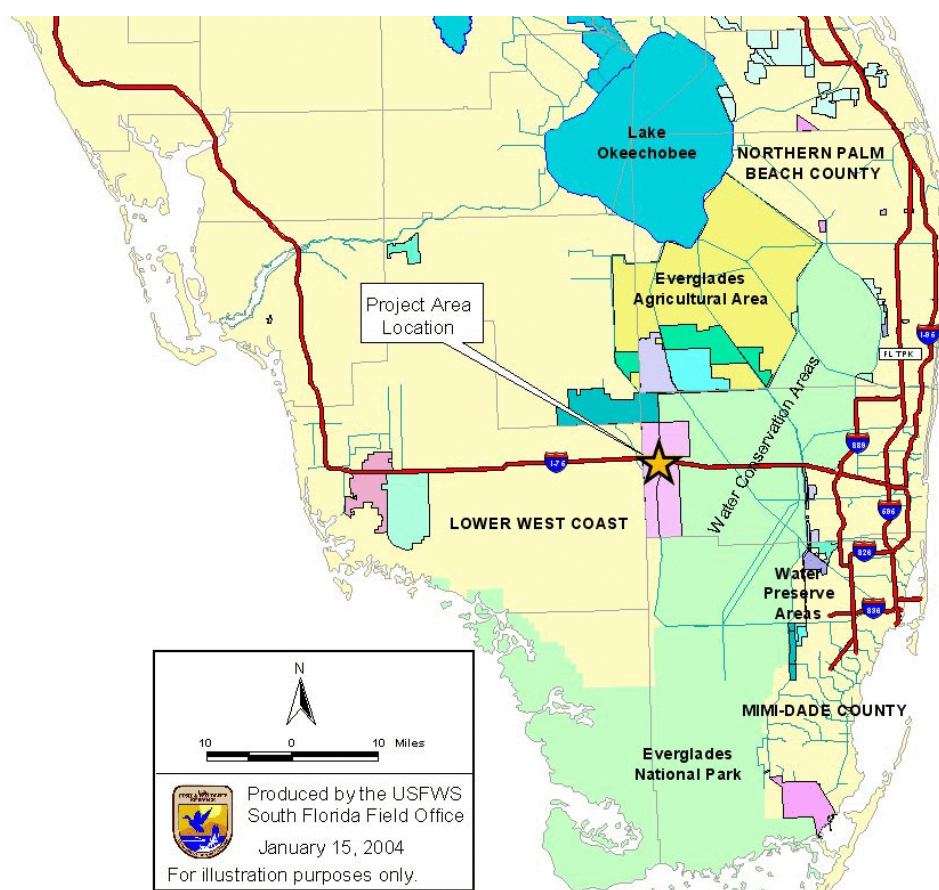


Figure 10-1. General location of the Big Cypress/L-28 Interceptor Modifications project. The project includes modification of levees and canals, water control structures, pumps, and STAs with a total storage capacity of 7,600 acre-feet located within and adjacent to the Miccosukee and Seminole Indian Reservations in Collier and Hendry Counties.

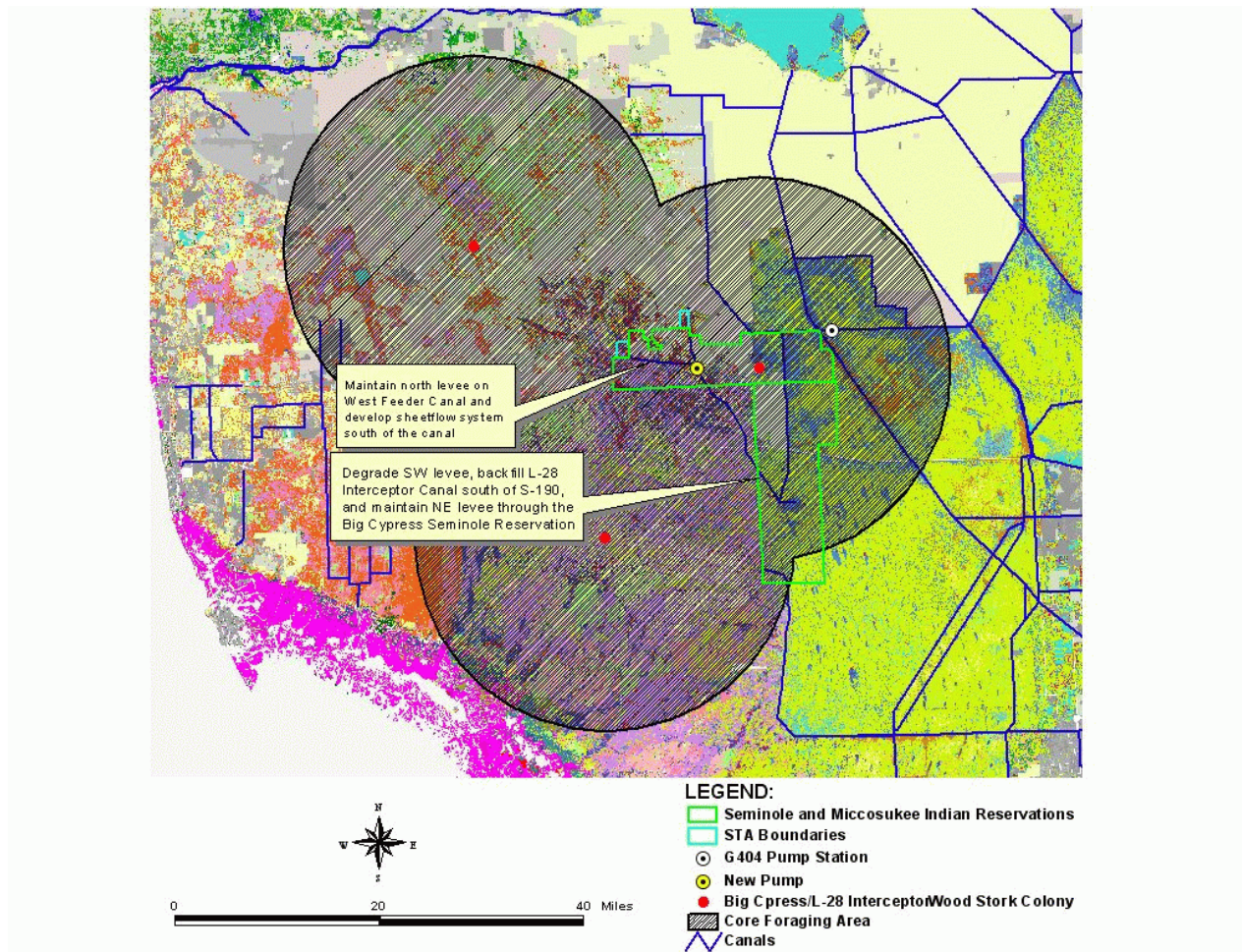


Figure 10-2. Major Big Cypress/L-28 Interceptor Modifications project features within the Core Foraging Area of three wood stork colonies.

The purpose of this project is to re-establish sheetflow from the West Feeder Canal across the Big Cypress Reservation and into the BCNP, maintain flood protection on Seminole Tribal lands, and ensure that inflows to the North and West Feeder Canals meet applicable water quality standards. Consistency with the Seminole Tribe's Conceptual Water Conservation System master plan will be maintained.

Upstream flows entering the West and North Feeder Canals will be routed through two STAs located at the upstream ends of the canals. Sheet flow will be re-established south of the West Feeder Canal by a system to be developed consistent with the Seminole Tribe's Conceptual Water Conservation System master plan. After conversion to a pump station, S-190 will also push flows south into the L-28 Interceptor Canal where sheet flow to the southwest will also be re-established with backfilling and degradation of the southwest levee of the canal.

Project design features:

- a. Degrade the levee on the SW side of the L-28 Interceptor Canal below the S-190 structure.
- b. Backfill the L-28 Interceptor Canal at a point south of the Big Cypress Reservation boundary with BCNP Addition.
- c. Retain levee on NE side of L-28 Interceptor through the Big Cypress Seminole Reservation.
- d. Develop sheetflow along the south side of the West Feeder Canal through three pump stations and spreader canals. The pump station locations shall be adjacent to the discharge points from Water Resource Areas 1, 2 and 3 of the Seminole Conceptual Water Conservation System.
- e. Pump station at Water Resource Area-1 discharge: 250 cfs.
- f. Pump station at Water Resource Area-2 discharge: 500 cfs.
- g. Pump station at Water Resource Area-3 discharge: 750 cfs.
- h. Replace S-190 gated structure (existing capacity of 2,960 cfs) with a 1,460-cfs pump station.
- i. North Feeder STA: 1,100 acres at 4-foot maximum depth.
- j. Inflow pump station: 270 cfs.
- k. 11Outflow structure: 100 cfs.
- l. West Feeder STA: 800 acres at 4-foot maximum depth.
- m. Inflow pump station: 430 cfs.
- n. Outflow structure: 150 cfs.

We estimate that 146 acres of the canal and levee system will be converted back to natural habitat. Potentially, 12 miles of canal bank may be degraded, 12 miles of canal may be back-filled along the L-28 Interceptor Canal and over 22 miles of levees constructed. Approximately 102 acres of cypress wetland will be filled for construction of structures and a spreader swale.

Initial effects analysis for Big Cypress/L-28 Interceptor Modifications

Land Use Patterns

The FLUCCS maps were used to determine the type of land classes found within the project. Table 10-1 summarizes the acres of habitat found within the footprint of the STAs. Table 10-2 summarizes the acres of habitat found within the footprint of the levees, structures and a spreader swale.

Table 10-1. The Florida Land Use, Cover and Forms Classification System (FLUCCS) area summaries and hydroperiods within stormwater treatment areas for the Big Cypress/L-28 Interceptor Modifications project.

FLUCCS Classification Type	FLUCCS Codes	Acres Impacted	Hydroperiod
Improved Pasture	211	242	
Unimproved Pasture	212	120	
Woodland Pasture	213	39	
Mixed Shrubs	6172	47	short
Cypress	621	410	long
Wetland Forest Mix	630	1030	long
Wet Prairie	643	12	short
Total		1,900	

Table 10-2. The Florida Land Use, Cover and Forms Classification System (FLUCCS) area summaries and hydroperiods for levees, structures, levels and canals for the Big Cypress/L-28 Interceptor Modifications project.

Activity Type	FLUCCS Classification Type	FLUCCS Codes	Acres Restore	Acres Impacted	Hydroperiod
Degrade Levees	Freshwater marsh	641	12		long
	Cypress	621	18		long
	Cypress/wet prairie	6219	43		short
Constructed Levees for STAs	Woodland Mixed	630		26	long
	Forest				
	Cypress	621		12	long
	Improved pasture	211		8	
	Unimproved pasture	212		6	
	Woodland pasture	213		1	
Backfill Canal	Freshwater marsh	641	12		long
	Cypress	621	18		long
	Cypress/wet prairie	6219	43		short
Spreader Swale	Cypress	621		68	long
Pump Stations	Cypress	621		30	long
Structures (control)	Cypress	621		4	long
Total			146	155	

Wood stork

Harm: Approximately 401 acres of pasture and 1,589 acres of wetlands lost by conversion to a long hydroperiod open water system that fluctuates up to four feet. Approximately 155 acres will be lost due to the construction of levees, control structures, pump stations and a spreader swale.

Benefit: Approximately 146 acres of canal system (degraded levees and canal backfilling) will be converted to cypress, cypress/wet prairie and freshwater wetlands.

During the planning process the Service's *Habitat Management Guidelines for the Wood Stork in the Southeastern Region*, U.S. Fish and Wildlife Service *Supplemental Habitat Management Guidelines for the Wood Stork In The South Florida Ecological Services Consultation Area* and *Wood Stork Standard Operating Procedures for Endangered Species* should be consulted.

Eastern indigo snake

There is suitable habitat for indigo snake in the project footprint. The Service's *Standard Measures for the Eastern Indigo Snake* should be implemented during project construction.

Harm: 1,900 acres of upland and wetland habitats lost by conversion to a long hydroperiod open water system that fluctuates up to four feet. Approximately 102 acres of long hydroperiod cypress wetlands will be lost for development of control structures, pump stations and a spreader swale. Approximately 81 acres of habitat will be filled in the construction of the STA levees. However, the levees will also serve as habitat, providing no net change in extent of habitat. Harm is possible during the construction process.

Benefit: Approximately 73 acres of canal system (canal backfilling) will be converted to cypress, cypress/wet prairie and freshwater. Approximately 81 acres of habitat will be created with construction of the STA levees.

Everglade snail kite

There are 1,500 acres of suitable habitat for snail kite with in the project footprint. However, no known breeding activities have been recorded or expected within the project footprint.

Harm: 1,440 acres of long hydroperiod wetlands lost by conversion to a long hydroperiod open water system that will fluctuate up to four feet and 114 acres of cypress lost for the construction of levels, control structures, swales and pump stations. Approximately 26 acres of wetland forest mix will be impacted for levee construction.

Benefits: Approximately 60 acres of canal system (canal backfilling and levee degrading) will be converted to cypress and freshwater marsh. Approximately 146 acres of canal system (canal backfilling and levee degrading) will be converted to cypress, cypress/wet prairie and freshwater marsh.

Bald Eagle

For new electrical lines near open water that may need to be installed for this project, the publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

Florida panther

The Florida panther's range includes the project area which falls within the Primary Zone.

Harm: Approximately 1,639 acres of high-quality habitat and 416 acres of medium-quality habitat will be lost to construction of STAs. A temporary loss of habitat will occur during the

construction of approximately 53 acres of levees, however the levees will provide habitat for the panther after construction, so this area will not be tallied as a loss of habitat.

Benefit: Approximately 73 acres of canal system (canal backfilling) will be converted to high-quality cypress, cypress/wet prairie and freshwater wetlands.

West Indian Manatee

Inland water control structures pose a danger to manatees as they make their way through the canal system. Manatees can access the project from Lake Okeechobee via canals and through the S-140 lift gate. The proposed backfilling of a portion of L-28 interceptor canal and construction of new pump stations and intake structures may place the manatee at risk for harm. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented in areas accessible to manatees. Additionally, operations of structures in locations accessible to manatees may cause further harm. However, the installation and operation of manatee exclusion devices at the pump stations should minimize the possibility of take during structure operation. A multi-agency team is developing additional guidance for structure design and manatee access.

Coordination with the Corps and the District

This project is not scheduled to begin until 2005. Therefore, no coordination with Corps and the District project managers to review this project description and effects analysis was possible.

Section 7 Consultation

No consultation activity has occurred for this inactive project.

11 Flow to Northwest and Central Water Conservation Area 3A

Flow to Northwest and Central WCA 3A project description

The purpose of the Flow to Northwest and Central WCA 3A project is to restore wetland structure and function in the northwest corner and west central portions of WCA 3A. The project is located in the southwest quadrant of Palm Beach County and the northwest quadrant of Broward County with portions falling within the Miccosukee Tribe of Indians Reservation (Fig. 11-1).

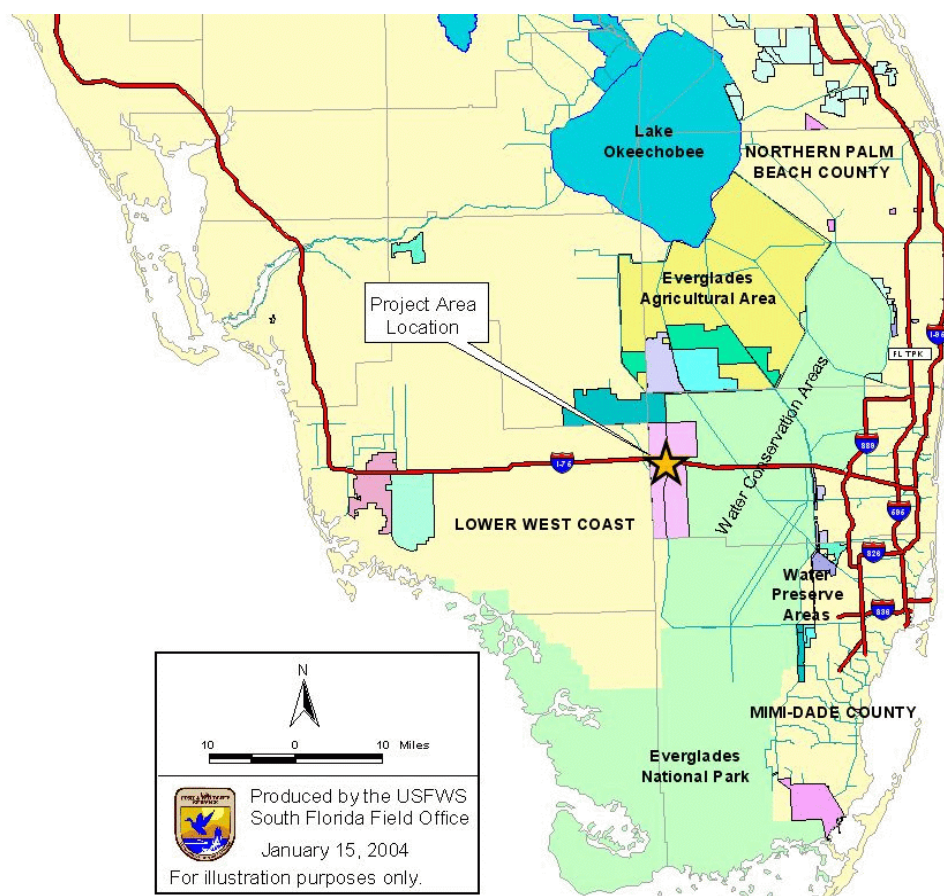


Figure 11-1. General location of the Flow to Northwest and Central Water Conservation Area 3A project. The project is located in the southwest quadrant of Palm Beach County and the northwest quadrant of Broward County with portions falling within the Miccosukee Tribe of Indians Reservation.

The CERP recommended plan for this project consists of two major components: (1) relocation and modifications to pump stations; and (2) development of a spreader canal system (Fig. 11-2). These actions are intended to increase environmental water supply availability, increase depths and extend wetland hydroperiods in the northwest corner and west-central portions of WCA 3A.

The capacity of the S-140 and G-404 pump stations will be increased and the S-140 pump station will be relocated. A spreader canal system at the relocated S-140 will reestablish sheetflow to the west-central portion of WCA 3A. The capacity of G-404 will be increased from 570 cfs to 1,000 cfs to provide the ability to deliver more water from the L-5 canal to the L-4 canal. Initially, CERP assumed that pump station G-404 capacity would be increased from 570 cfs to 1,000 cfs by the Everglades Construction Project prior to the start of this CERP project. However, the Everglades Construction Project will not increase its pumping capacity to 1,000 cfs, so the CERP project will need to accomplish the upgrade. Pump station S-140 will be relocated approximately eight miles south and its capacity increased from 1,300 cfs to 2,000 cfs and the spreader canal will be constructed along the southernmost eight miles of the L-28 canal (north reach). Exact locations have not yet been determined.

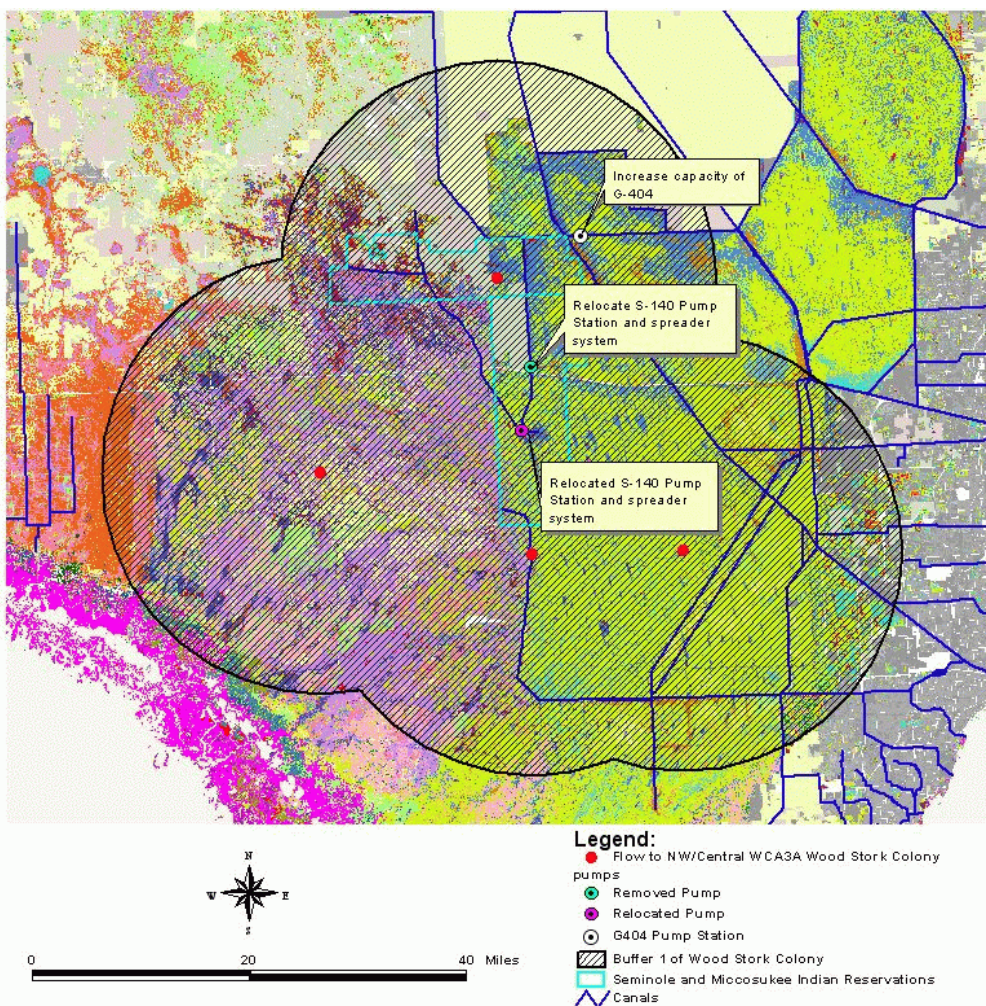


Figure 11-2. Major features of the Flow to Northwest and Central Water Conservation Area 3A project within the Core Foraging Areas of 4 wood stork colonies (18.6-mile zone outside the colony).

Footprint of project features are: (1) remove pump station S-140; (2) relocate pump station S-140 (area of disturbance approximately 5 acres); (3) increase pump capacity of S-140 from 1,300 cfs to 2,000 cfs and create a spreader canal system for water delivery to the central portions of WCA 3A; and (4) spreader canal may be on the southern most end of the L-28 and may approximate 50 feet in width and two miles in length (area of disturbance approximately 6 acres). Exact sizing is not known at this time.

Water quality treatment of flows was assumed to be provided by the Everglades Construction Project and water quality treatment strategies developed to fulfill the non-Everglades Construction Project requirements of the Everglades Forever Act. If additional treatment is determined to be required as a result of future detailed planning and design work, those existing facilities would be modified to provide the necessary treatment. However, it is apparent that the water quality treatment of flows cannot be met as provided for by the Everglades Construction Project and water quality treatment strategies developed to fulfill the Everglades Construction Project requirements of the Everglades Forever Act. Therefore, the project has been put on indefinite hold until a strategy is developed to meet these water quality standards. For the purposes of this report, we will evaluate the project as described above. When future modifications are made, the analysis will be updated.

Initial effects analysis for the Flow to Northwest and Central WCA 3A project

Wood stork

The project is entirely within the CFA (colony within 18.6 miles) of 4 wood stork colonies (Fig. 11-2). Data on nesting was available for only one of the four colonies, this colony consisted of 400 nests from 2000 through 2001.

Harm: Approximately five acres of wetland habitat will be temporarily filled to remove S-140 pump station. After removal is completed, the wetlands and bank will be restored. Approximately five acres of wetland habitat will be filled and convert to upland utilities use for the relocation and operation of S-140 pump. The spreader canal will convert approximately six acres of wetland habitat to open water habitat.

During the planning process the Service's *Habitat Management Guidelines for the Wood Stork in the Southeastern Region*, U.S. Fish and Wildlife Service *Supplemental Habitat Management Guidelines for the Wood Stork In The South Florida Ecological Services Consultation Area* and *Wood Stork Standard Operating Procedures for Endangered Species* should be consulted.

Eastern indigo snake

There is suitable habitat for the indigo snake in the project footprint. The Service's *Standard Measures for the Eastern Indigo Snake* should be implemented during project construction.

Harm: Approximately five acres of wetland habitat will be temporarily filled to remove S-140 pump station. Once the pump is removed, the wetlands and canal banks will be restored. Approximately five acres of wetland habitat will be filled and convert to upland utilities use for the relocation and operation of S-140 pump. The spreader canal will convert approximately six acres of wetland habitat to open water habitat.

Everglade snail kite

There is suitable habitat for the Everglade snail kite in the project footprint. However, no known breeding activities have been recorded within the project footprint.

Harm: Five acres of wetlands will be lost for construction of the S140 pump. Approximately six acres of wetland will be converted to open water as part of the spreader canal.

Florida panther

The Florida panther's range includes the project area which falls within the Primary Zone.

Harm: Five acres of high quality wetland habitat will be lost for construction of the S-140 pump. The spreader canal construction will convert approximately acres of high quality wetland habitat to open water unsuitable for panthers.

West Indian Manatee

Inland water control structures pose a danger to manatees as they make their way through the canal system. Manatees can access the project from Lake Okeechobee via canals and through the L-28 to pump station S-140. The S-140 is proposed to be relocated south of its present location. During the construction phase the manatee will be at risk for disturbance or injury and operations of the relocated pump could also trap or crush manatees. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented in areas accessible to manatees. A multi-agency team is developing additional guidance for structure design and manatee access.

Coordination with Corps and The District for the Flow to Northwest and Central WCA 3A project

November 1, 2002. Kickoff Meeting of the PDT.

February 11, 2003. PMP sent to PDT for review and next meeting of the PDT set for March 13, 2003.

March 10, 2003. PDT meeting for March 13, 2003 to discuss the PMP cancelled indefinitely due to water quality considerations that are outside the control of the project.

Section 7 consultation

Consultation has not been initiated for this project

WCA 3 Decompartmentalization and Sheetflow Enhancement - Part 1 project description

The purpose of Decompartmentalization of WCA 3 (Decomp) is to reconnect WCAs 3A and 3B and Everglades National Park (ENP). This will be achieved by removing most flow obstructions to achieve unconstrained or passive flow between WCAs 3A and 3B and Northeast Shark River Slough and reestablishing the ecological and hydrologic connection between these areas. Although all of Decomp's physical modifications to the Everglades are limited to WCA 3, the hydrologic needs and ecological impacts associated with Decomp would influence systems as far away as Lake Okeechobee and Florida Bay.

The current goals and objectives of Decomp are presented in the PMP (Section 3.2):

Goal: Restore historical sheetflow distributions, depth patterns, hydroperiods and hydrologic connectivity in the ridge and slough, marl prairie, and rocky glades landscapes, and identify the amount of water to be reserved or allocated for the natural system, thereby creating a sustainable environment suitable for the recovery and long-term survival of native flora and fauna in concert with related projects.

Objectives:

- a. Remove or reduce the effects of landscape discontinuities that are caused by roads, levees, canals, drainage ditches, and spoil banks by removing barriers to sheet flow.
- b. Improve sheet flow, hydropatterns, and hydroperiods within WCA 3 and ENP, focusing on areas east of S-333.
- c. In as much [*sic*] as it would be practical, create opportunities for passive water management of WCA 3 and ENP.
- d. Increase the capacity of water supply deliveries to ENP in accordance with CERP restoration goals.
- e. Recommend features, assumptions, constraints and sequencing to be considered in the Decomp Part 2 and other related CERP projects.
- f. Promote more natural hydrologic recession rates throughout the ridge and slough, marl prairie, and rocky glades landscapes.
- g. Promote recreational opportunities consistent with Everglades restoration.
- h. Reduce the pathways for the occurrence and dispersal of invasive exotic species.
- i. Restore, maintain, and sustain ridge and slough topography.

- j. Integrate project objectives and features with other related projects (*i.e.*, Modified Water Deliveries, Combined Structural and Operational Plan, Water Preserve Area (WPA) Feasibility Study, Rainfall Driven Operations, and C-111 Projects).
- k. Restore and recover existing populations of migratory birds and their habitat, particularly species of wading birds and species listed as endangered, threatened, or species of special concern by the State and Federal governments, in the Central and Southern Everglades.
- l. Maintain the spatial extent and function of wetland resources in WCA 3A, 3B and ENP.
- m. Increase fish and wildlife connectivity, including terrestrial species.
- n. Increase the spatial extent and restore vegetative composition, habitat function, and productivity of tree islands, and help compensate for past losses
- o. Restore peat soils, depth and micro-topography.

A basic assumption is that related restoration projects and plans (Modified Water Deliveries, WPA Feasibility Study, Combined Structural and Operational Plan, and C-111) will be completed as designed and scheduled. This would allow Decom to build upon and integrate designs such as the Modified Water Deliveries construction of a 3,000-foot bridge to convey flows from the L-29 Borrow Canal to ENP.

Project Footprint

Decomp is composed of two parts. Planning for Part 1 is underway, with construction completion anticipated in April 2010. Part 1 would provide short-term opportunities for restoring sheetflow, connectivity, hydropatterns, and hydroperiods among eastern WCA 3A and WCA 3B, and ENP. The project footprint for both parts of Decom includes all of WCA 3, which encompasses approximately 594,000 acres.

Conceptual design features from the Comprehensive Plan, as stated in the Master PMP for CERP, include the following features (Fig. 12-1):

- a. Backfilling all or portions of the Miami Canal and degrading all or portions of the associated borrow levee south of S-8 in WCA 3A to S-31, the east coast protective levee.
- b. Increasing the conveyance capacity of the North New River Canal between WCA 2 and WCA 3, from S-7 to S-34 to compensate for conveyance lost from the Miami Canal.
- c. Degrading all or portions of the L-29 Levee from S-333 east to L-334 and filling in all or portions of the L-29 borrow canal in the same location.
- d. Raising and bridging all or portions of the Tamiami Trail, from S-333 east to S-334.

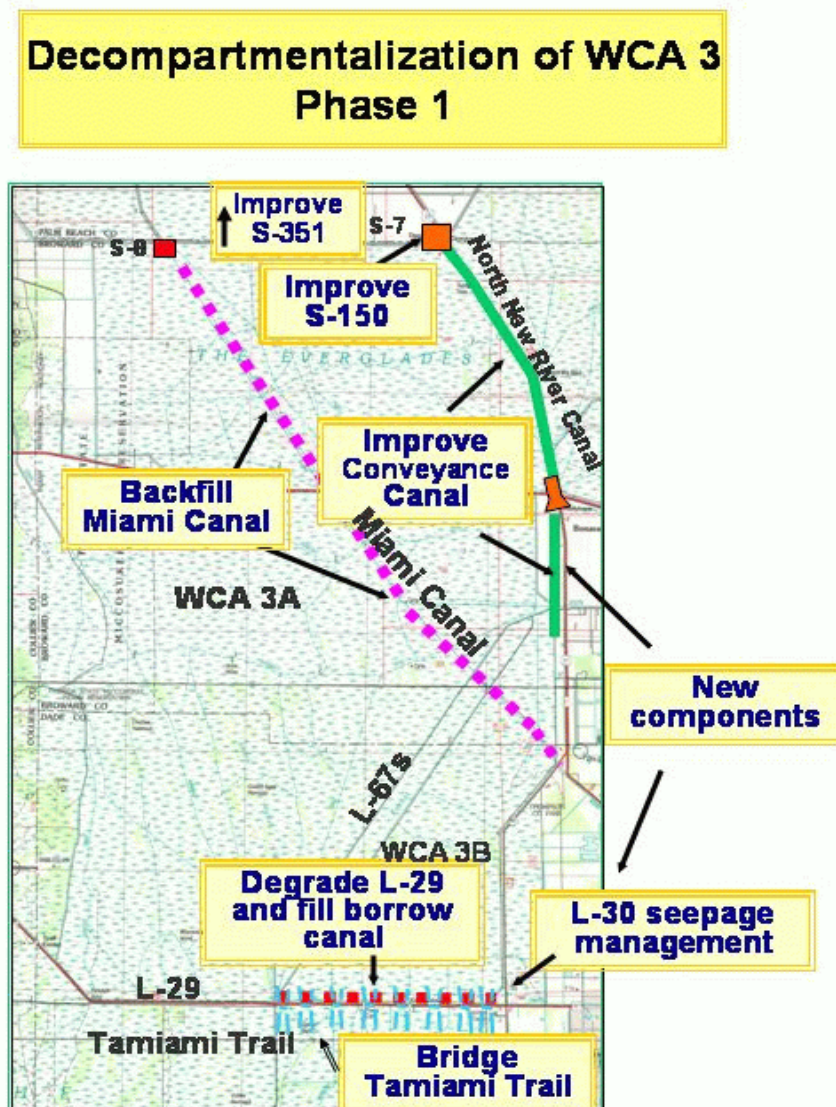


Figure 12-1. Conceptual design for Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement, Part 1 (Appendix B [modified]; Corps 2002c).

Two new project components are being added to Part 1 of Decomp:

- a. Increased conveyance in the L-37 borrow canal between the C-11 and C-9 canals.
- b. L-30 seepage management at southeast corner of WCA 3B.

For the purpose of this document, the L-37 conveyance component is addressed in the Broward County Water Preserve Area project description. The L-30 seepage management component is addressed herein.

The conceptual plan described above will be the starting point for development of alternative project modifications to be evaluated during the PIR process. Alternative plans to be developed and evaluated may include a combination of leaving canals in place, partial canal filling, placement of fill plugs at strategic locations, the creation of tree islands from levee material, and the conversion of canals to more natural deep slough habitats.

Initial effects analysis for the WCA 3 Decompartmentalization and Sheetflow Enhancement - Part 1 project

The PDT for this project has not yet begun to formulate and evaluate alternatives; therefore, all potential harm to threatened and endangered species is based on the Project Information section in the PMP and information provided by the Corps. Information on the precise location, seasonal timing, and duration of Decomp construction activities will be developed during future detailed planning and design phases of the project. Therefore, analyses of the precise effects of construction activities on listed species will be conducted in the future as detailed designs and scheduling are completed. As the project planning moves forward and other alternatives are considered, a different preferred alternative may be chosen that would result in different effects to endangered species. Pending further evaluation by the PDT and for the purposes of this report, configuration of the levees, canals, roads, and structures as envisioned by CERP would be used to determine potential effects on threatened and endangered species. The general information now available suggests that these construction activities could have adverse effects on some listed species and their habitats, although the exact extent and magnitude of these adverse effects cannot be determined at this time.

Federally listed species and critical habitat that are known to occur or could occur in the footprint area and which could be affected by the proposed action include the Everglade snail kite, snail kite critical habitat, wood stork, Florida panther, West Indian manatee, eastern indigo snake, and Okeechobee gourd. Portions of information regarding listed species were garnered from the MSRP.

Modifications to existing canals and levees and removal of levees and their associated canals would require prolonged use of heavy construction equipment and may require potentially disruptive construction techniques such as blasting. Several known snail kite and wood stork nesting areas occur immediately adjacent to portions of these levees slated for removal (Bennetts et al. 1994; Ogden 1994; Bennetts and Kitchens 1997a). The Service believes that wood stork and snail kite individuals could be harassed and could abandon nesting activities due to physical and/or noise disturbance resulting if these construction activities occur during the breeding season and birds are actively engaged in breeding activities. Such harassment could cause nesting individuals to flush from their nests, increasing the likelihood of egg or nestling

predation. In addition, the West Indian manatee may be found within canals, and both the Florida panther and eastern indigo snake are known to occur along levees in the Decomp project area.

Wood stork

The Service has applied the *Habitat Management Guidelines for the Wood Stork in the Southeast Region* (Ogden 1990) to the Tamiami West and Tamiami East Colonies based on mapped coordinates. A distance of 1,500 feet from the mapped colony location was chosen for the Primary Zone and a distance of 1,150 feet from the Primary Zone, extending in all directions, was chosen for the Secondary Zone. The 1,500-foot Primary Zone was selected because of year-to-year variation in the specific sites where storks nest within the colony area and because of the precision of mapped locations. Wood storks in the Tamiami West Colony nested as close as 300 feet south of Tamiami Trail during the 2000 nesting season, when an estimated 1,300 storks nested at this site. The Tamiami East and West colonies are mixed wading bird colonies also supporting nesting snowy egrets, great egrets, white ibis, and tricolored herons.

As mapped in the manner described above, the existing alignment of the Tamiami Trail and L-29 levee and canal overlaps the Tamiami West Colony Primary (2,935 feet) and Secondary (2,286 feet) Zones. The Primary Zone of the Tamiami East Colony also overlaps the existing alignment of the Tamiami Trail and L-29 canal (2,947 feet). The Secondary Zone overlaps an additional 2,330 feet of the highway and canal. The Tamiami East colony location has not supported stork nesting since 1992, but the colony site will continue to be protected, as per current guidance. Activity restrictions intended to avoid disturbance to nesting storks within the Secondary Zone would be lifted if absence of stork nesting activity at this colony site is confirmed. The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Stork in the South Florida Consultation Area* should be consulted during project planning.

All of WCA 3, and consequently all of the Decomp Part 1 components, falls within the 18.6-mile CFAs of known stork colonies, and any modifications to features within the project area would affect stork CFAs.

Harm: Wood storks could be harassed and could abandon nesting activities due to physical and/or noise disturbance resulting from construction activities if activities occur during the breeding season and birds are actively engaged in breeding activities. Such harassment could cause nesting individuals to flush from their nests, increasing the likelihood of nest failure or loss of eggs or nestlings to predation. Construction activities involved in increasing the conveyance of the North New River Canal would impact 267 acres of wetlands immediately adjacent to the existing canal. L-30 seepage management would impact an additional 20 acres of wetlands.

Benefit: A total of 196 acres (L-29 removal from S-333 east to S-334) and 602 acres (filling of Miami Canal) of suitable foraging habitat may be restored.

Everglade snail kite

Although backfilling the Miami Canal with adjacent levees would remove 184 acres of uplands that provide potential roosting habitat, it would provide 602 acres of snail kite foraging habitat. The closest snail kite nest to eastern Tamiami Trail is located in WCA 3B, 6,500 feet north of the existing alignment of the Tamiami Trail. Due to the potential project area being adjacent to snail kite critical habitat and nesting areas, construction schedules should include provisions for surveys to determine if snail kites are present near the construction site and measures to adjust the timing and/or location of construction activities to avoid disturbance to snail kites or kite nesting.

Snail kite nesting can shift dramatically from year to year and, based on recent snail kite nesting data provided by Dr. Victoria Drietz, University of Florida, snail kite nesting appears to be on the increase in southern WCA 3B. The Service, ENP, and FWC will continue to monitor snail kite nesting patterns in both WCA 3 and ENP, and will notify the Corps of any nesting activity that may affect Decomp.

The Decomp project footprint includes area that has been designated as snail kite critical habitat. Part 1 of Decomp will effect approximately 113 acres of designated critical habitat through backfilling the Miami Canal from Alligator Alley to the L-67C canal.

Harm: Snail kites could be harassed and could abandon nesting activities due to physical and/or noise disturbance resulting from construction activities if activities occur during the breeding season and birds are actively engaged in breeding activities. Such harassment could cause nesting individuals to flush from their nests, increasing the likelihood that eggs or nestlings would be lost to predation. Additionally, 184 acres of potential roosting habitat may be removed.

Benefit: A total of 196 acres (L-29 removal from S-333 east to S-334) and 602 acres (Miami Canal) of suitable foraging habitat may be restored.

West Indian manatee

The West Indian manatee may use canals within the Decomp project area and may be present at construction sites. Two manatees died within or near the project area during the 2001 winter. Based on information from FWC (Penny Husted, FWC, personal communication 2003), one manatee apparently migrated from Lake Okeechobee, where gates were open due to drought conditions, through a series of canals and structures, into the L-67 canals, and eventually to the L-29 canal east of S-333. The second manatee died north of S-150 in the L-18 canal within the EAA. While these are unusual events, it attests to the fact that manatees can be found within the project area. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during project construction.

Harm: Mortality or disturbance could result from construction in the Miami Canal, North New River Canal, and the L-29 canal.

Benefit: None

Florida panther

Telemetry data indicate that panthers utilize the L-67 extension, northern Miami Canal, and areas adjacent to Tamiami Trail in ENP as upland secondary habitat (Service 1999a). All of the Decomp Part 1 footprint falls within the consultation area for the Florida panther.

Harm: Impacts to 50 acres (Miami Canal levees) of current high-quality panther habitat within the Primary/Dispersal Zone and to 250 acres of high-quality panther Secondary Zone habitat (98 acres of the L-29 levee, 152 acres of Miami canal levee). These effects are temporary, and result from conversion from upland levees to both forested and unforested freshwater marsh habitat, which is also high-quality panther habitat. Construction activities in or near panther habitat may also result in harm through disturbance and disruption of normal movement patterns.

Benefit: Degrading levees with roads and bridging eastern Tamiami Trail has the potential to allow panthers to travel between ENP and WCA 3B without the risk of vehicular collisions. Back-filled canals may provide 25 acres of high-quality panther habitat within the Primary/Dispersal Zone and 125 acres of high-quality panther habitat within the Secondary Zone after marsh vegetation becomes re-established on filled canals. Removal of levees and canals would also eliminate potential barriers to panther movements and restore the natural pattern of habitats across the landscape.

Eastern indigo snake

Potential breeding and foraging habitat exists for the eastern indigo snake on the Miami Canal levees, where they may use crab holes in lieu of gopher tortoise burrows (Lawler 1977). Therefore, removal of Miami Canal levees could destroy eastern indigo snake habitat and may result in death or injury of eastern indigo snake individuals present during construction. Other levees within the project area also serve as roads and provide less suitable habitat, though surveys of these areas have not been conducted. The Service recommends the *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction to minimize or avoid any potential adverse effects on this species.

Harm: Impacts to 282 acres of habitat (184 acres of upland levees along the Miami Canal and 98 acres on the L-29 levee). Possible mortality due to excavation and construction activities.

Benefit: None

Okeechobee gourd

Decomp is outside of the current known distribution of the Okeechobee gourd, and effects to the gourd are consequently unlikely. However, in 1974, an occurrence of Okeechobee gourd was recorded along the North New River Canal in Broward County, within the project area. The levees and wetlands along the Miami Canal also represent potential gourd habitat. Seed dispersal from populations in Lake Okeechobee are possible through these two canals. Consequently, the Service recommends conducting surveys for the Okeechobee gourd along these canals prior to initiating construction activity. However, it is likely that these canal populations are ephemeral and of discountable importance to the species. Therefore, we will not analyze disturbance or loss of potential habitat resulting from the Decomp Project for this species.

Harm: None

Benefit:

Coordination with Corps and the District for the WCA 3 Decompartmentalization and Sheetflow Enhancement - Part 1 project

March 31, 2003 - Project description e-mailed to the Corps (Kim Taplin) and District (Dewey Worth) project managers for review and consent. Ideas were exchanged at PDT meetings.

PDT meetings and sub-team meetings occur at least monthly with phone and e-mail coordination occurring weekly.

Developed 15 preliminary performance measures and provided comments of many additional performance measures developed by other agencies.

Consultation Documents

Consultation has not been initiated on this project.

WCA 3 Decompartmentalization and Sheetflow Enhancement - Part 2 project description

The purpose of Decomp is to reconnect WCAs 3A and 3B and ENP. This will be achieved by removing most flow obstructions to achieve unconstrained or passive flow between WCAs 3A and 3B and Northeast Shark River Slough and reestablishing the ecological and hydrologic connection between these areas. Although all of Decomp's physical modifications to the Everglades are limited to WCA 3, the hydrologic needs and ecological effects associated with Decomp would influence systems as far away as Lake Okeechobee and Florida Bay.

The current goals and objectives of Decomp are presented in the PMP (Section 3.2):

Goal: Restore historical sheetflow distributions, depth patterns, hydroperiods and hydrologic connectivity in the ridge and slough, marl prairie, and rocky glades landscapes, and identify the amount of water to be reserved or allocated for the natural system, thereby creating a sustainable environment suitable for the recovery and long-term survival of native flora and fauna in concert with related projects.

Objectives:

- a. Remove or reduce the effects of landscape discontinuities that are caused by roads, levees, canals, drainage ditches, and spoil banks by removing barriers to sheet flow.
- b. Improve sheet flow, hydropatterns, and hydroperiods within WCA 3 and ENP, focusing on areas east of S-333.
- c. In as much [*sic*] as it would be practical, create opportunities for passive water management of WCA 3 and ENP.
- d. Increase the capacity of water supply deliveries to ENP in accordance with CERP restoration goals.
- e. Recommend features, assumptions, constraints and sequencing to be considered in related CERP projects.
- f. Promote more natural hydrologic recession rates throughout the ridge and slough, marl prairie, and rocky glades landscapes.
- g. Promote recreational opportunities consistent with Everglades restoration.
- h. Reduce the pathways for the occurrence and dispersal of invasive exotic species.
- i. Restore, maintain, and sustain ridge and slough topography.

- j. Integrate project objectives and features with other related projects (*i.e.*, Modified Water Deliveries, Combined Structural and Operational Plan, Water Preserve Areas Feasibility Study, Rainfall Driven Operations, and C-111 Projects).
- k. Restore and recover existing populations of migratory birds and their habitat, particularly species of wading birds and species listed as endangered, threatened, or species of special concern by the State and Federal governments, in the Central and Southern Everglades.
- l. Maintain the spatial extent and function of wetland resources in WCA 3A, 3B and ENP.
- m. Increase fish and wildlife connectivity, including terrestrial species.
- n. Increase the spatial extent and restore vegetative composition, habitat function, and productivity of tree islands, and help compensate for past losses.
- o. Restore peat soils, depth and micro-topography.

A basic assumption is that related restoration projects and plans Modified Water Deliveries, Water Preserve Areas Feasibility Study, Combined Structural and Operational Plan, and C-111) will be completed as designed and scheduled. This would allow Decom to build upon and integrate designs such as the Modified Water Deliveries construction of a 3,000-foot bridge to convey flows from the L-29 Borrow Canal to ENP.

Project Footprint

Decomp is composed of two parts. Part 2 applies the same concepts as Part 1 to improve the sheetflow and connectivity to ENP and deliver additional quantities of water to the southern Everglades as more storage features in CERP are completed. The project footprint for both parts of Decom includes all of WCA 3, which encompasses approximately 594,000 acres. Part 2 planning will begin in May 2006, with construction to be completed in November 2014. It includes the following features (Fig. 13-1):

- a. Degrading the L-29 levee west of the L-67s (with an evaluation of the need to fill in the associated borrow canal).
- b. Degrading the L-68A levee.
- c. Removing L-28 levee and L-28 tie back levee.
- d. Degrading L-67C levee and backfilling borrow canal.
- e. Degrading the southern portion of L-67A levee and backfilling borrow canal, and creating weirs in the northern portion of L-67A.

f. Raising and bridging Tamiami Trail west of S-333.

The conceptual plan described above will be the starting point for development of alternative project modifications to be evaluated during the PIR process. Alternative plans to be developed and evaluated may include a combination of leaving canals in place, partial canal filling, placement of fill plugs at strategic locations, the creation of tree islands from levee material, and the conversion of canals to more natural deep slough habitats.

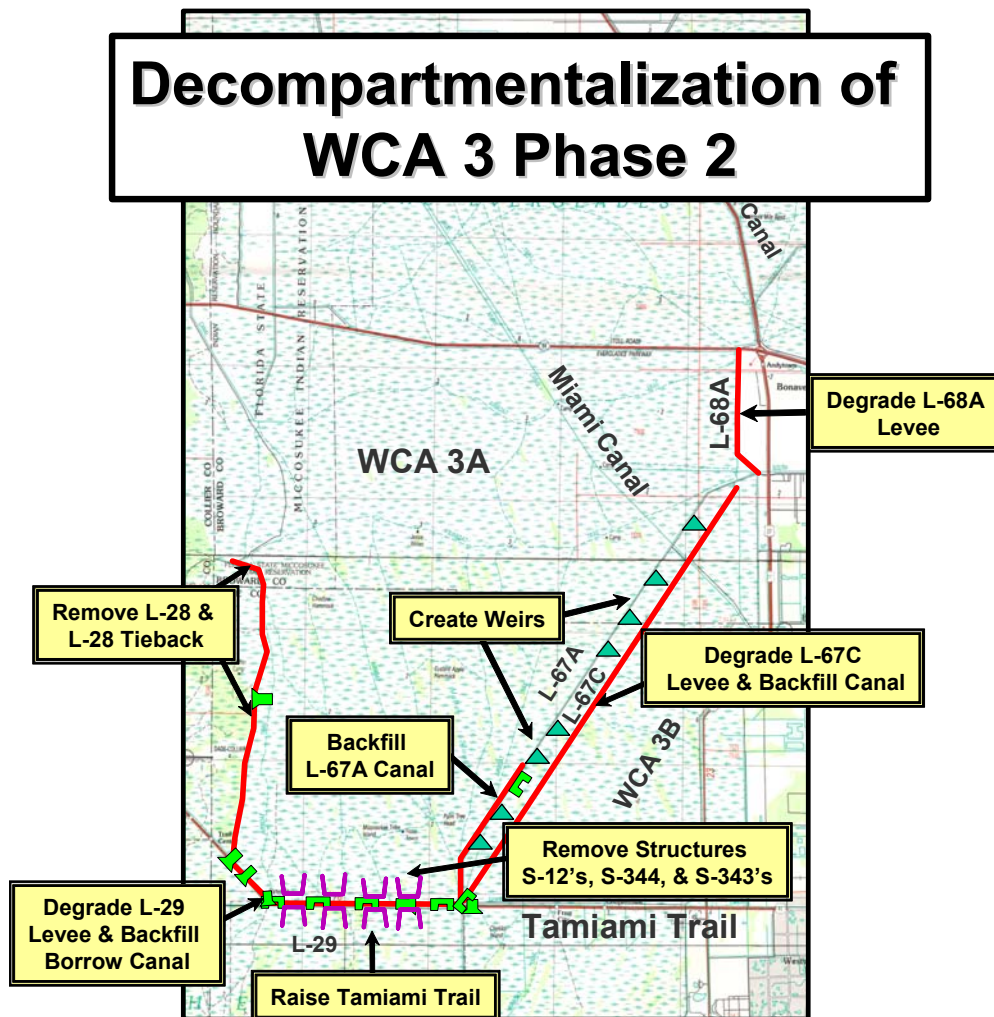


Figure 13-1. Conceptual design for Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement, Part 2 project (Appendix B; Corps 2002c).

Initial effects analysis for the WCA 3 Decompartmentalization and Sheetflow Enhancement - Part 2 project

The PDT for this project has not yet begun to formulate and evaluate alternatives; therefore, all potential harm to threatened and endangered species is based on the Project Information section in the PMP for Part 1. Information on the precise location, seasonal timing, and duration of Decomp construction activities will be developed during future detailed planning and design phases of the project. Therefore, analyses of the precise effects of construction activities on listed species will be conducted in the future as detailed designs and scheduling are completed. As the project planning moves forward and other alternatives are considered, a different preferred alternative may be chosen that would result in different effects to endangered species. Pending further evaluation by the PDT and for the purposes of this report, configuration of the levees, canals, roads, and structures as envisioned by CERP would be used to determine potential effects on threatened and endangered species. The general information now available suggests that these construction activities may have adverse effects on some listed species and their habitats, although the exact extent and magnitude of these adverse effects cannot be determined at this time.

Federally listed species and critical habitat that are known to occur or could occur in the footprint area and which could be affected by the proposed action include the Everglade snail kite, snail kite critical habitat, wood stork, Florida panther, West Indian manatee, and eastern indigo snake. Portions of information regarding listed species were garnered from the MSRP.

Removal of levees and their associated canals would require prolonged use of heavy construction equipment and may require potentially disruptive construction techniques such as blasting. Several known snail kite and wood stork nesting areas occur immediately adjacent to portions of these levees slated for removal (Bennetts et al. 1994; Ogden 1994; Bennetts and Kitchens 1997b). The Service believes that wood stork and snail kite individuals could be harassed and could abandon nesting activities due to physical and/or noise disturbance resulting if these construction activities occur during the breeding season and birds are actively engaged in breeding activities. Such harassment could cause nesting individuals to flush from their nests, increasing the likelihood of egg or nestling predation. In addition, the West Indian manatee may be found within canals, and both the Florida panther and eastern indigo snake are known to occur along levees in the Decomp project area.

Wood stork

The Service has applied the *Habitat Management Guidelines for the Wood Stork in the Southeast Region* (Ogden 1990) to the L-28 Crossover and Jetport Colonies based on mapped coordinates. A distance of 1,500 feet from the mapped colony location was chosen for the Primary Zone and a distance of 1,150 feet from the Primary Zone, extending in all directions, was chosen for the Secondary Zone. The 1,500-foot Primary Zone was selected because of year-to-year variation in

the specific sites where storks nest within the colony area and because of the precision of mapped locations.

As mapped in the manner described above, the existing alignment of the L-28 canal and levee overlaps the colony's Primary (2,689 feet) and Secondary (2,447 feet) Zones. The L-28 canal and levee also overlaps the Jetport colony's Primary (2,980 feet) and Secondary (2,454 feet) Zones. The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Stork in the South Florida Consultation Area* should be consulted during project planning.

All of WCA 3, and consequently all of the Decomp Part 2 project components, fall within the 18.6-mile CFAs of known stork colonies, and any modifications to features within the project area would affect stork CFAs.

Harm: Wood storks could be harassed and could abandon nesting activities due to physical and/or noise disturbance resulting from construction activities if activities occur during the breeding season and birds are actively engaged in breeding activities. Such harassment could cause nesting individuals to flush from their nests, increasing the likelihood that eggs or nestlings would be lost to predation.

Benefit: A total of 1,682 acres of suitable foraging habitat may be restored from degrading the following levees and backfilling the canals: L-68A (198 acres), L-28 and L-28 tie back (415 acres), L-67A (206 acres), L-67C (580 acres), and western L-29 (282 acres).

Everglade snail kite

Snail kite nesting can shift dramatically from year to year. During the past decade, southern WCA 3A has supported a large number of snail kite nesting effort in most years, and several nests have occurred in close proximity to proposed construction areas, such as along the L-28 canal. The Service, ENP, and FWC will continue to monitor snail kite nesting patterns in both WCA 3 and ENP, and will notify the Corps of any nesting activity that may affect Decomp. Due to the potential project area being adjacent to known nesting areas and within snail kite critical habitat, the Service recommends that construction schedules include provisions for surveys to determine if snail kites are present near the construction site and measures to adjust the timing and/or location of construction activities to avoid disturbance.

Large parts of the Decomp Part 2 project footprint have been designated as snail kite critical habitat. The Decomp Part 2 project will effect approximately 1,577 acres of snail kite designated critical habitat. The calculation of this figure may vary because most of the canals that are proposed for back-fill or degradation are used to describe the perimeter of the critical habitat designation in WCA 3A.

Harm: Snail kites could be harassed and could abandon nesting activities due to physical and/or noise disturbance resulting from construction activities if activities occur during the breeding season and birds are actively engaged in breeding activities. Such harassment could cause nesting individuals to flush from their nests, increasing the likelihood that eggs or nestlings would be lost to predation. Approximately 741 acres of potential roosting habitat on upland levees may be impacted.

Benefit: A total of 1,682 acres of suitable foraging habitat may be restored from degrading the following levees and backfilling the canals: L-68A (198 acres), L-28 and L-28 tie back (415 acres), L-67A (206 acres), L-67C (580 acres), and western L-29 (282 acres).

West Indian manatee

The West Indian manatee may use canals within the Decomp project area and may be present at construction sites. Two manatees died within or near the project area during the 2001 winter. While the use of WCA 3A is unusual, it attests to the fact that manatees can be found within inland waterways. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during project construction.

Harm: Mortality or disturbance could result from construction activities.

Benefit: None

Florida panther

Telemetry data indicate that panthers utilize the L-67 extension, northern Miami Canal, and areas adjacent to Tamiami Trail in ENP as upland secondary habitat (Service 1999a). All of the Decomp Part 2 footprint falls within the consultation area for the Florida panther.

Harm: Impacts to 334 acres of high-quality upland levee habitat (274 along the L-28 and tie back levees and 60 along the L-67A levee) will occur within the panther Primary/Dispersal Zone. An additional 167 acres of effects to high-quality upland levee habitat along the L-67A (22 acres) and the L-67-C (145 acres) canals will occur within the panther Secondary Zone. These effects are temporary, and result from conversion from upland levees to both forested and unforested freshwater marsh habitat, which is also high-quality panther habitat. Construction activities in or near panther habitat may also result in harm through disturbance and disruption of normal movement patterns.

Benefit: Degrading levees with roads and bridging western Tamiami Trail, allowing panthers in ENP to access WCA 3A, has the potential to decrease the risk of vehicular collisions. Backfilling canals will also remove features that may inhibit movements. Backfilling canals may also provide 292 acres freshwater marsh habitat of high value within panther Primary/Dispersal Zone and 139 acres of high-quality freshwater marsh habitat within the

panther Secondary Zone once marsh vegetation becomes established. Removal of levees and canals would also eliminate potential barriers to panther movements and restore the natural pattern of habitats across the landscape.

Eastern indigo snake

Levees within the project area also serve as roads and provide only marginally suitable habitat for indigo snakes, though surveys of these areas have not been conducted. Removal of levees may consequently reduce habitat availability within the project area. The Service recommends the *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction to minimize or avoid any potential adverse effects on this species.

Harm:

- a. Impacts may occur to 766 acres of upland levees that may provide indigo snake habitat (274 acres of the L-28 levee, 83 acres of the L-67A levee, 290 acres of the L-67C levee, and 119 acres of the L-68 levee).
- b. Possible mortality due to excavation and construction activities.

Benefit: None

Coordination with Corps and the District for the WCA 3 Decompartmentalization and Sheetflow Enhancement - Part 2 project

Decomp Part 2 is scheduled to be addressed after the implementation of Part 1. Consequently, there has been little coordination to date specifically addressing Part 2. However, most of the coordination occurring during Decomp Part 1 will also apply to Part 2.

Consultation Documents

Consultation has not been initiated on this project.

Loxahatchee National Wildlife Refuge Internal Canal Structures project description

This CERP project includes two water control structures in the northern ends of the perimeter canals encircling the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Loxahatchee Refuge), also known as WCA 1, in Palm Beach county (Fig. 14-1). The purpose of the project is to improve water delivery characteristics (timing and depth distribution) within the Loxahatchee Refuge. The PDT for this team has not formed yet, and the project is not active. Therefore, the location of the structures has not been determined. For the purpose of this analysis, we will assume the structures would be located downstream of the outflow for STA1E and STA1W.

Footprint effects for this project would be minor. The primary concern for this project is the quality of water discharged into the Loxahatchee Refuge for rehydration from the STAs. WCA 1 is primarily a rainfall driven system characterized by low total dissolved solids, conductivity, calcium, hardness, alkalinity, and other parameters. Water in the perimeter canals tends to be higher in nutrients and of lower quality than the water in the interior. Discharging water from the STAs through the perimeter canals for rehydrating habitat in the northern portion of WCA 1 would be beneficial, however, only if it did not degrade present water quality or contribute to deposition of phosphorous in the soils. Soil and water quality must be measured in the proposed rehydration area to determine baseline conditions. Soils in the perimeter canal must also be tested for baseline phosphorous levels, and it may be necessary to dredge high phosphorous soils from the canal bottom prior to discharging water from the canal into the interior to avoid additional nutrient loading.

At the present time, no modeling exists to determine whether the placement of structures in the perimeter canals would accomplish the goal of rehydrating the northern interior marsh. There is a concern that water would instead flow south to the central interior causing flooding in habitat that is currently of high quality. Some determination needs to be made regarding the path of water once it is discharged into the Loxahatchee Refuge. Modeling has not been undertaken to evaluate the ability of the structures to create enough head to push water north into the interior. Before this project is seriously considered, modeling and data collection must be done to answer critical questions regarding water flow and water quality.

Initial effects analysis for the Loxahatchee NWR Internal Canal Structures project

Information regarding the location of wood stork colonies was obtained from the Loxahatchee Refuge database. Species are assumed to inhabit any suitable habitat as described in the MSRP.

Wood stork

Harass: Wood stork nesting colonies exist within 18.6 miles of the proposed construction sites. Temporary loss of foraging habitat within the CFAs for birds from these colonies may occur due to disturbance during construction.

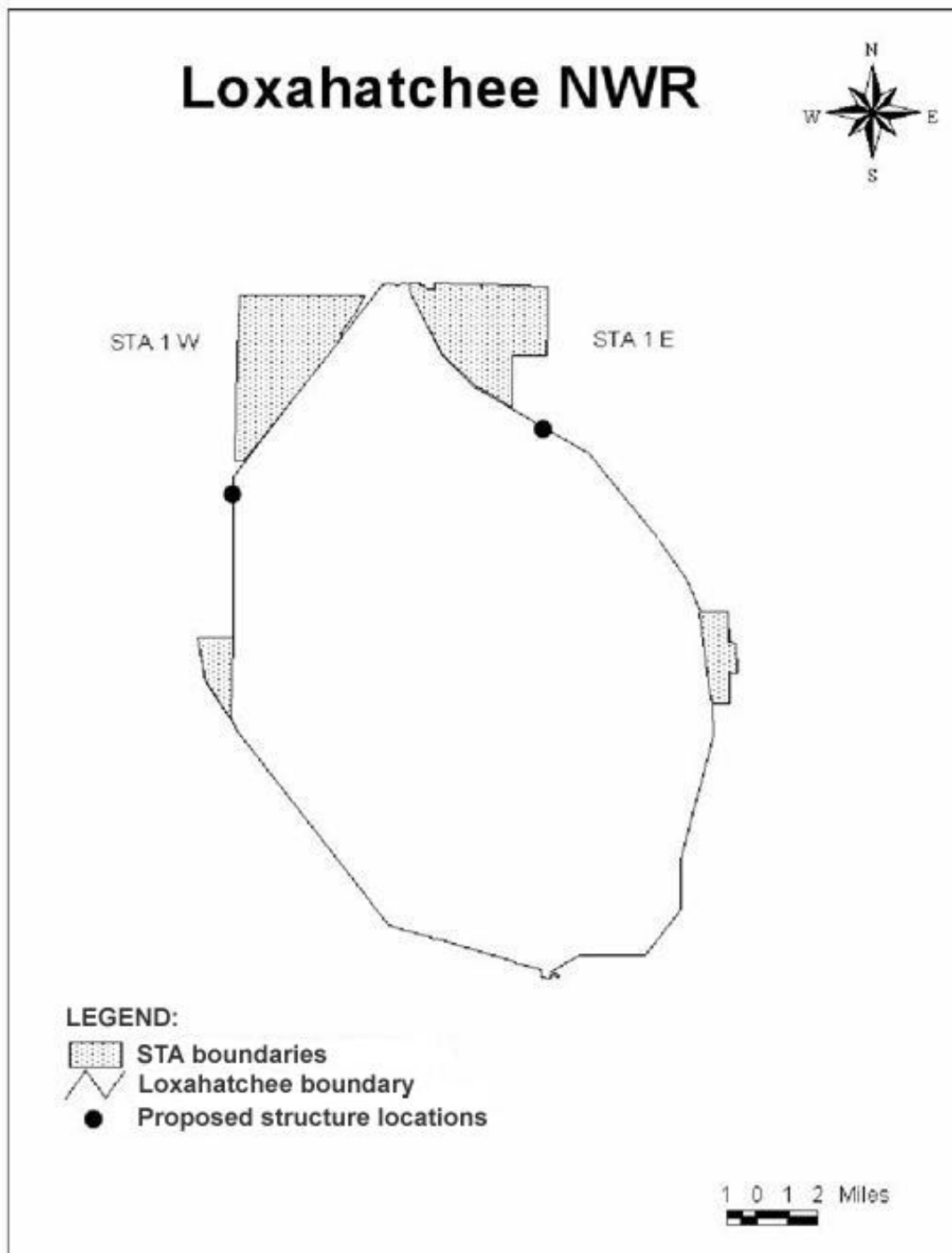


Figure 14-1. Proposed location of structures in perimeter canal for the Loxahatchee National Wildlife Refuge Internal Canal Structures project.

The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Guidelines for the Wood Storks in the South Florida Ecological Services Consultation Area* should be consulted during project planning.

Coordination with Corps and the District for the Loxahatchee NWR Internal Canal Structures project

The PDT for this team has not formed yet, and the project is not active, therefore, no project managers were available for coordination.

Section 7 consultation

No consultation has been completed for this inactive project.

15, 16 Modify Holey Land and Rotenberger Wildlife Management Areas Operation Plans

Modify Holey Land and Rotenberger Wildlife Management Areas Operation Plans project description

The Holey Land Wildlife Management Area is a 35,350-acre parcel of Everglades marsh located in southwest Palm Beach County (Fig. 15-1). The Rotenberger Wildlife Management Area is a 27,810-acre parcel of Everglades marsh also located in southwest Palm Beach County (Fig. 15-1), bordered on the east by the Miami canal and on the south by WCA 3A. These tracts are owned by the State of Florida's Trustees of the Internal Improvement Trust Fund and are leased to the FWC for fish and wildlife management purposes. These two areas constitute about one-half of the remnant Everglades sawgrass marsh. A plan to restore a more natural hydroperiod in the Holey Land and Rotenberger Wildlife Management Areas was initiated by the District in 1990. Prior to this water management regime, these areas were drier than historically and experienced several muck fires which damaged the soils. Exotic plants are invading the Wildlife Management Areas and threatening the sawgrass ecosystem they support. The Wildlife Management Areas provide habitat for populations of wading birds, waterfowl, deer, and hogs. Modification of the operation schedules for both areas to reflect a rainfall-driven system and promote restoration of the historic sawgrass/tree island ecosystem is outlined as a component of the CERP. The project consists of the following components:

- a. an inflow/outflow operational schedule delivering water to the Holey Land and Rotenberger Wildlife Management Areas during both wet and dry seasons.
- b. rainfall-based operational rules that provide for natural depth variations without extreme high and low stages which cause flood or drought conditions.
- c. improvement of additional outflow structures to support outflow operations.

Initial effects analysis for the Modify Holey Land and Rotenberger Wildlife Management Areas Operation Plans projects

There will be no construction effects to wildlife because this project will not be modifying the existing structures, just changing the operation of them.

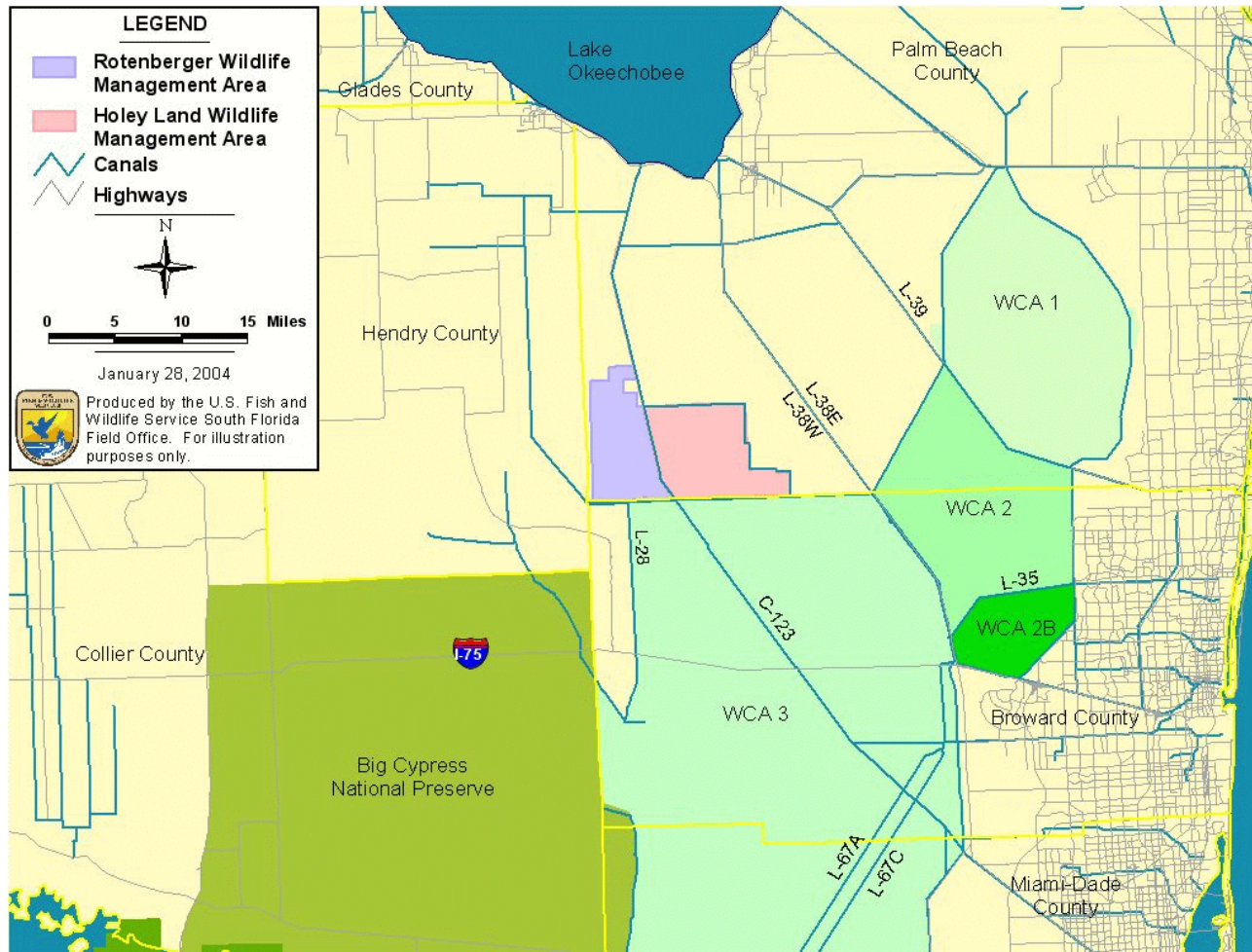


Figure 15-1. Location of Holey Land and Rotenberger Wildlife Management Areas.

Coordination with Corps and the District for the Modify Holey Land and Rotenberger Wildlife Management Areas Operation Plans projects

April 2, 2003 email discussion with Brad Clark at the Corps regarding project descriptions. He gave some suggested revisions which were incorporated.

May 29, 2003 email to Kathy Meyers at the Corps to confirm that no new structures will be built.

Section 7 consultation

Consultation has not been initiated on this project.

North Palm Beach County - Part 1 project description

This project includes six separable elements: Pal-Mar and J.W. Corbett Wildlife Management Area Hydropattern Restoration, L-8 Basin Modifications, C-51 and L-8 Reservoir, Lake Worth Lagoon Restoration, C-17 Back-pumping and Treatment, and C-51 Back-pumping and Treatment, located east of Lake Okeechobee in northern Palm Beach and southern Martin Counties (Fig. 17-1). These separable elements are combined into a single project area, totaling approximately 400,000 acres, to address the interdependencies and tradeoffs between the different elements and provide a more efficient and effective overall project design. The approximate acres for individual study areas are: Pal-Mar/Loxahatchee (140,000 acres), Lake Worth Lagoon (19,000 acres), L-8 Basin (190,000 acres), C-51 (90,000 acres) and C-17 (22,000 acres) (Fig. 17-2). Because of the interconnected nature of project elements, there is a 60,000-acre overlap of the Pal-Mar study area with the L-8 basin study area.

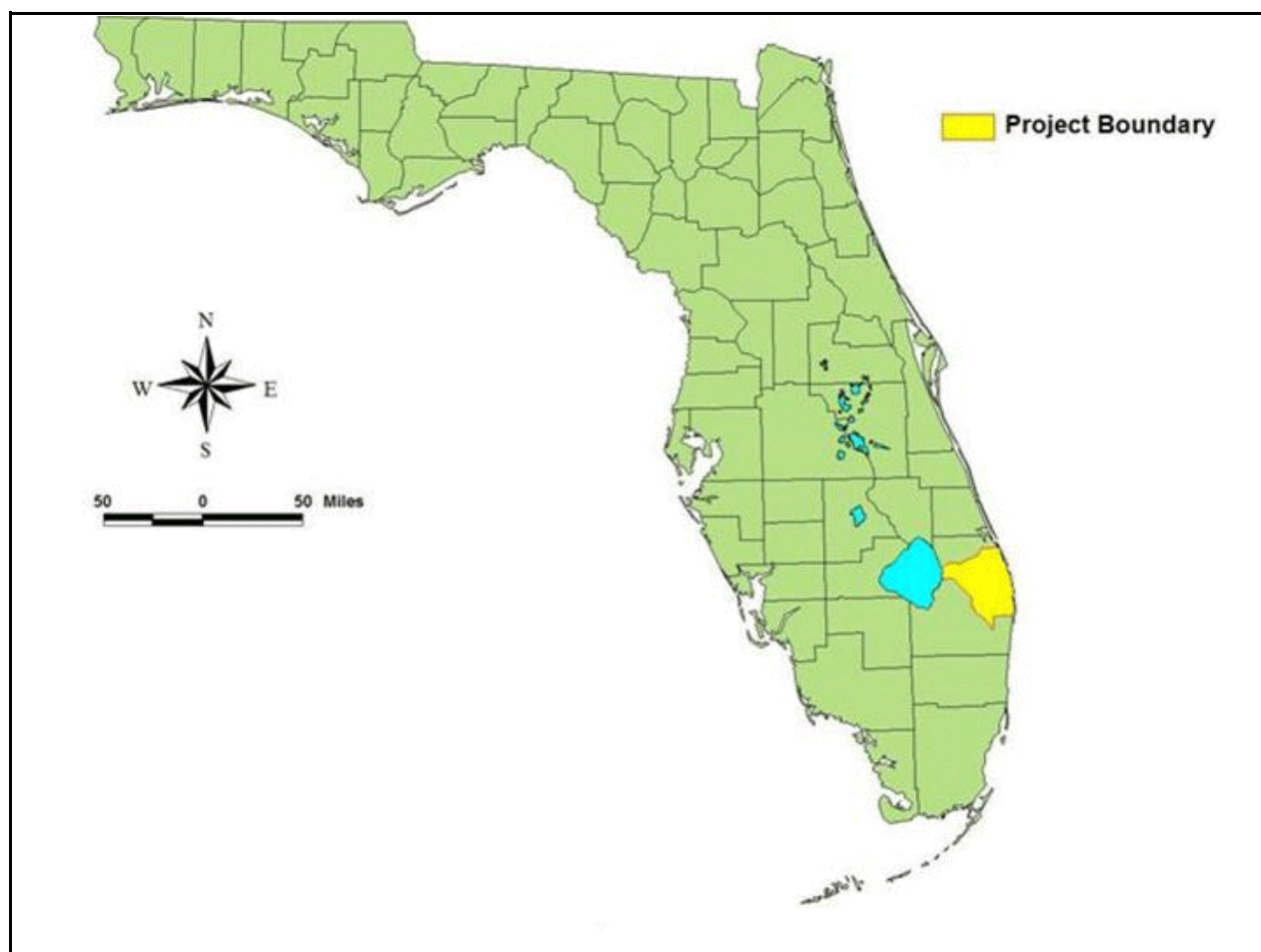


Figure 17-1. North Palm Beach County - Part 1 project location.

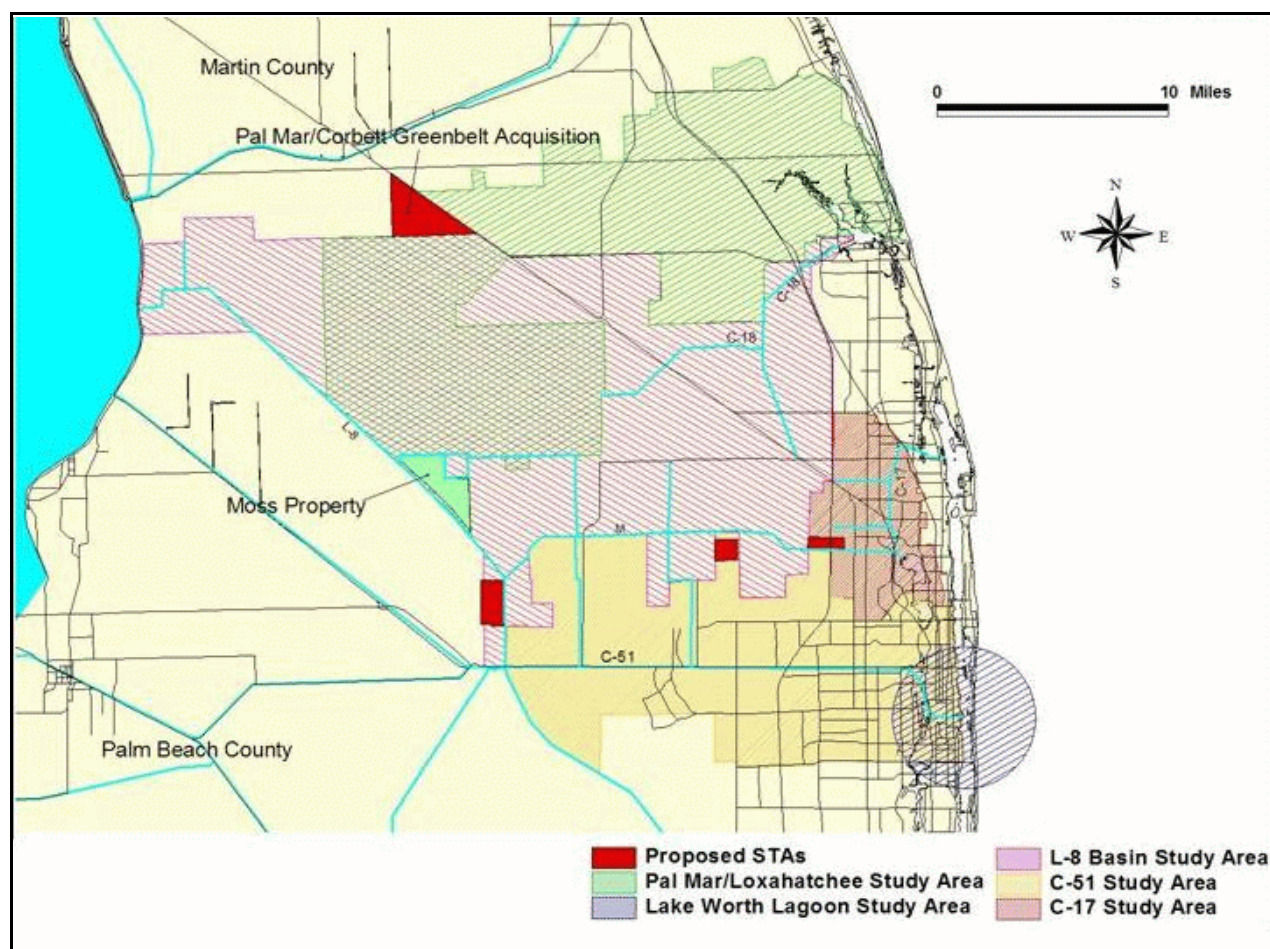


Figure 17-2. North Palm Beach County - Part 1 project study areas.

Pal-Mar and J.W. Corbett Wildlife Management Area Hydropattern Restoration

The purpose of this project element is to provide hydrologic connections between the J.W. Corbett Wildlife Management Area and the Moss Property, the C-18 Canal, the Indian Trail Improvement District, Loxahatchee Slough, and the L-8 Borrow Canal. Considered improvements include new or modified water control structures, canal modifications and the acquisition of 3,300 acres located between the Pal-Mar basin and J.W. Corbett Wildlife Management Area for construction of an STA. These connections will reduce detrimental effects of over-inundation on native vegetation frequently experienced during the wet season, improve water quality and extend the footprint of the contiguous green belt to 126,000 acres. This green belt extends from the Dupuis Reserve near Lake Okeechobee eastward to the J.W. Corbett Wildlife Management Area, and northeast to Jonathan Dickinson State Park.

Land Acquisition. Approximately 3,300 acres of primarily undeveloped land will be acquired and converted to an STA as a green belt connection between Pal-Mar and J.W. Corbett Wildlife Management Area. The southern property boundary of this parcel is the Martin/Palm Beach County line, and the eastern boundary is the Beeline Highway. The dominant natural community within this area is wetland hardwood forests (approximately 1,700 acres), with herbaceous wetlands (approximately 740 acres), upland hardwood forests (approximately 450 acres), and cypress swamp (approximately 140 acres). Improved pasture, row crops and citrus grove total approximately 140 acres. The conceptual map of this area also shows approximately 160 acres of impact to a highway right-of-way on the northeast boundary, although the precise location of the acquisition will likely be moved to avoid the road.

L-8 Basin Modifications

This project element involves modifications to the L-8 basin by a series of new pumps, water control structures, and canal capacity improvements in the M Canal. The purpose is to make the C-51 and L-8 Reservoir functional and thereby increase water supply availability while maintaining or enhancing flood protection for northern Palm Beach County. This component will also provide conveyance necessary to deliver flows required to enhance hydroperiods in the Loxahatchee Slough, increase base flows to the Northwest Fork of the Loxahatchee River, and reduce high discharges to the Lake Worth Lagoon.

C-51 and L-8 Reservoir

The purpose of this project element is to increase water supply availability in northern Palm Beach County, to reduce the seasonal discharge of fresh water into the Lake Worth Lagoon, and to provide ancillary drainage benefits for northern Palm Beach County. It will also provide additional flow to enhance hydroperiods in the Loxahatchee Slough, and increase base flows to the Northwest Fork of the Loxahatchee River.

This project element includes a combined above-ground/in-ground reservoir (Palm Beach Aggregate site) with a total storage capacity of approximately 48,000 acre-feet, located west of the L-8 Borrow Canal and north of the C-51 Canal in Palm Beach County. The initial design for the reservoir assumed a 1,250-acre reservoir with the water level fluctuating from 10 feet above grade to 30 feet below grade. The final size, depth, and configuration of this facility will be determined through more detailed planning and design.

Water will be pumped into the reservoir from the C-51 Canal and Southern L-8 Borrow Canal during the wet season or periods when excess water is available, and returned to the C-51 and L-8 canals during dry periods. This component or portions of this component may be implemented under a previous authorization, but will be analyzed here as part of CERP.

Lake Worth Lagoon Restoration

This project element includes possible sediment removal in the C-51 Canal, and also possibly muck removal or capping in the Lake Worth Lagoon within a distance of 2.5 miles up and downstream of the confluence of the C-51 Canal and the lagoon. A prototype project will be conducted to determine the feasibility and potential cost of removing and disposing of sediments in the lagoon versus capping them. This project element includes the evaluation of sediment traps to reduce future accumulation of sediment.

The purpose of this project element is to improve water quality and allow for the reestablishment of seagrasses and benthic communities within the Lake Worth Lagoon. The elimination of the organically enriched sediment from the C-51 Canal discharge will provide for long-term improvements to the Lagoon and enable success for additional habitat restoration and enhancement projects planned by Palm Beach County. At this time, it is not known where dredged sediments will be disposed. Currently being considered is the option of disposing of the material in vacant land within the urban areas adjacent to the lagoon. These areas are currently disturbed, and contain no natural habitat, so there will be no effects to listed species by disposing the dredged material in this manner.

C-17 Backpumping and Treatment

This project element includes backpumping facilities on the C-17 Canal, and an STA with a total storage capacity of approximately 2,200 acre-feet located in northeastern Palm Beach County. The design assumes a 550-acre STA with the water level fluctuating up to 4 feet above grade. The final size, depth, and configuration of this facility will be determined through more detailed planning and design, and will address appropriate pollution load reduction targets necessary to protect receiving waters (*e.g.*, West Palm Beach Grassy Waters Preserve). The currently proposed STA site is approximately 550 acres, consisting of freshwater marsh (approximately 175 acres), pine flatwoods (approximately 130 acres), cypress (approximately 125 acres), mixed wetland hardwoods (approximately 65 acres), and borrow areas (approximately 10 acres). Another 45 acres are currently in reservoirs.

The purpose of this project element is to capture and store excess freshwater that is currently discharged to the Lake Worth Lagoon through the C-17 Canal. This captured water will be used to increase water flow to the Loxahatchee Slough by passing the water through Grassy Waters Preserve. Excess C-17 Canal water will be backpumped through existing canals and proposed water control structures to the STA, which will provide water quality treatment prior to discharge into the Grassy Waters Preserve.

C-51 Back-pumping and Treatment

The purpose of this project element is to increase water supplies to Grassy Waters Preserve and Loxahatchee Slough by capturing and storing excess flows currently discharged to the Lake Worth Lagoon from the C-51 Canal.

The project includes backpumping facilities and an STA with a total storage capacity of approximately 2,400 acre-feet located in Palm Beach County. The design includes a 600-acre STA with the water level fluctuating up to 4 feet above grade. The final size, depth, and configuration of this facility will be determined through more detailed planning and design, and will address appropriate pollution load reduction targets necessary to protect receiving waters (e.g., West Palm Beach Grassy Waters Preserve). The currently proposed STA site is approximately 600 acres, consisting of pine flatwoods (approximately 300 acres), herbaceous wetlands (approximately 260 acres), and wetland forest (approximately 40 acres).

The conceptual design allows excess water from the C-51 Canal to be backpumped through existing and proposed water control structures and canals to the STA. The STA will provide water quality treatment prior to discharge into Grassy Waters Preserve.

Construction Elements of North Palm Beach County - Part 1 Project

Approximate facility sites are identified in the PMP, however exact locations for the new structures have not yet been determined. New features that are proposed in this plan include: three STAs, one reservoir, one canal, seven water control structures, twelve pumps, four culverts, as well as modifications to existing canals.

New Canal: A new canal (300-cfs capacity) will extend the existing E-1 Canal from the C-51 to the proposed western STA for Grassy Waters Preserve as part of the C-51 back-pumping and treatment element of CERP.

Proposed water control structures include:

- a. 1,500-cfs emergency overflow structure on the northeast side of the 1,200 acre Palm Beach Aggregate site,
- b. control structure on the intersection of the C-51 Canal and the M-1 Canal,
- c. relocation and increased capacity of control structure (S-155A) on the C-51 Canal to the east of the M-1 Canal,
- d. 400-cfs gravity control structure within the Loxahatchee Slough,

- e. 100-cfs gravity discharge structure between the proposed western STA and Grassy Waters Preserve,
- f. 100-cfs gravity structure between the proposed eastern STA and Grassy Waters Preserve, and,
- g. control structure on the L-8 Borrow Canal north of the Indian Trails Improvement District impoundment.

Proposed pump facilities include:

- a. 1,500-cfs inflow pump and 300-cfs outflow pump on the L-8 for the Palm Beach Aggregate site,
- b. 300-cfs pump on the M-Canal north of Palm Beach Aggregate site,
- c. 300-cfs upper basin pump on the M Canal,
- d. 200-cfs lower basin pump on the M Canal,
- e. 50-cfs pump on the northeast corner of Grassy Waters Preserve,
- f. S-319 pump on the C-51 Canal into STA-1E,
- g. S-155A pump for back-pumping the C-51 Canal,
- h. 200-cfs pump to accompany the new culvert between the Turnpike Canal and North Palm Beach County ID Canal,
- i. 150-cfs pump between the western STA of Grassy Waters Preserve and the Turnpike Canal,
- j. 300-cfs pump between the new E-1 Canal extension and the eastern STA for Grassy Waters Preserve, and,
- k. 300-cfs pump at the intersection of the E-1 Canal and C-51 Canal.

Improved Water Control Structures: Improvements are planned for the existing control structure under the Beeline Highway between Grassy Waters Preserve and the Loxahatchee Slough, and the culvert on the E-1 Canal under Okeechobee Road (planned capacity of 300 cfs).

Proposed culvert locations include:

- a. culvert connection into the Turnpike Canal from the North Palm Beach County I D Canal (under SR710),
- b. 200-cfs culvert under 45th Street,
- c. 150-cfs culvert into the STA for Grassy Waters Preserve, and,
- d. 200-cfs culvert under the Turnpike.

Canal Modifications: Detailed design plans for canal modifications are not yet available for review, however reference to improved flow in the North Palm Beach County PMP indicates that deepening and or widening the M and the E-1 Canals for improved flow will be required for increased capacity.

Initial effects analysis for the North Palm Beach County - Part 1 project

Placement of this project's reservoir and STAs may result in habitat loss for a number of listed species (actual habitat loss will vary between species, dependent upon individual species' habitat requirements). Additional adverse effects are possible resulting from STA operations that create "attractive nuisance" conditions. Siting is not yet determined for the new E-1 Canal extension, twelve new pump stations, and seven water control structures; therefore analysis of effects is not possible at this time. Information on the precise location, seasonal timing, and duration of each construction element will be developed during future detailed planning and design phases of the project, thus analyses of effects will be conducted as planning and phasing is complete.

Adverse effects may occur with the dredging of the new E-1 Canal extension to the proposed STA west of Grassy Waters Preserve. The location for this canal has not yet been determined, although it is possible that it may extend approximately 0.5 mile through cypress, freshwater marsh, pine flatwoods, mixed wetland hardwoods and improved pasture. Native habitat may be lost and adjacent natural communities fragmented by the new canal. If the canal is placed in pristine habitat, this would cause the loss of 6 acres of habitat (assuming a 100-foot wide canal including infrastructure). Habitat acres may also be lost due to placement of new pumps and water control structures. Without exact designs, the amount of impact caused by these structures can only be estimated. Assuming 5 acres of impact for each pump station (including staging area for construction activities), and 2 pumps associated with this new canal, there would be an estimated impact of 10 acres. Estimated effects from levees forming the three new STAs is 64 acres, and for the reservoir is 22 acres, assuming maximum width and height measurements allowable under construction guidelines for reservoirs and STAs used for the IRL Feasibility Study (Corps 2002d). The effects from these levees have been included in the impact estimations in the following species accounts.

Everglade snail kite

Snail kite habitat in Grassy Waters Preserve and Loxahatchee Slough may be improved through the establishment of more natural hydrologic conditions caused by proposed canal improvements and STAs, although changes in the operations of the Grassy Waters Preserve may reduce cumulative benefits. Disturbances due to temporary reductions in available habitat from the timing of component implementation are likely to cause temporary adverse effects to snail kite habitat. The current proposed locations for the STAs, structures and canals will effect approximately 1,561 acres of existing snail kite habitat, although this number may vary, dependent upon the final locations of the STAs.

Florida scrub-jay

Florida scrub-jays and their habitat occur along the coastal ridge in Martin and northern Palm Beach counties, specifically within the Pal-Mar/Loxahatchee study area. Construction and operation of STAs and canal improvements are not likely to affect Florida scrub-jays or their habitat, because suitable scrub-jay habitat is some distance from the footprints of the proposed actions.

Red-cockaded woodpecker

Nesting colonies of red-cockaded woodpeckers have been reported in the J.W. Corbett Wildlife Management Area, Jonathan Dickinson State Park, and southwest of Grassy Waters Preserve. Additional suitable habitat is spread throughout undeveloped portions of this Project area. Construction and improvement to the canal system throughout northern Palm Beach County is not expected to affect the pine flatwoods habitat required by this species. However, the currently proposed locations for the STAs cumulatively encompass approximately 875 acres of pine flatwoods, which would be eliminated by constructing STAs.

Wood stork

A wood stork nesting colony has been recorded near the eastern border of Grassy Waters Preserve along the dividing line between the L-8 Basin and C-17 Basin Study Areas. The two proposed STAs adjacent to Grassy Waters Preserve are both within the CFA of this colony, but outside its Primary and Secondary Zones. Suitable nesting and foraging habitat exists throughout the North Palm Beach County project area. This habitat will be improved by restoring more natural hydrologic conditions to the remaining natural areas. An overall increase in fish availability will provide improved foraging in many areas.

Disturbances due to loss of foraging habitat in the proposed STAs are likely to cause adverse effects. The currently proposed locations for the STAs may effect approximately 3,200 acres of existing wood stork feeding and roosting habitat. The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service*

Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area should be consulted during project planning.

Eastern indigo snake

Construction and operation of STAs and improvements to existing canals are likely to eliminate eastern indigo snake habitat. There are 5,400 acres of suitable snake habitat contained within the currently proposed STA and reservoir footprints. However, considering the nature of the water levels and habitat conditions within the STAs, suitable snake habitat (post-construction) is likely to be replaced within the STAs. Approximately 1,200 acres of snake habitat will be permanently lost from the construction of the proposed reservoir. More precise estimates of habitat loss for indigo snakes will not be available until final locations are chosen for the STAs.

Additionally there may be habitat loss associated with the E-1 canal extension, which is not yet sited, and from construction of new water control structures along the existing canals, if these structures are located within native habitat (worst case impact of approximately 16 acres). The Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Audubon's crested caracara

There have been sporadic sightings of Audubon's crested caracara in the northern portion of the project area (southern Martin County), but the majority of the North Palm Beach County project area is outside the known nesting range for this species. Construction of the STAs and a reservoir within the Project footprint may possibly affect some Audubon crested caracara habitat. The caracara is known to utilize a variety of habitat types for feeding, nesting and roosting, including much of what exists as natural lands in the project area. They prefer to nest in cabbage palms surrounded by open, low ground cover areas. Caracara foraging areas are frequently man-modified habitats including improved pasture, open agricultural lands, and roadway and power line corridors.

The two southernmost of the proposed STAs and the proposed reservoir are outside of the caracara's range, but the northernmost proposed STA is within the range, and near the recorded caracara sightings. This proposed STA footprint contains approximately 3,000 acres of suitable caracara habitat including pine flatwoods, mixed wetland hardwoods, cypress, freshwater marsh, wetland forest, temperate hardwoods and wet prairie. Additionally, there are approximately 300 acres of man-modified land included within the STA footprint that caracaras may also exploit, such as improved pasture, row crops, roadway corridors, and power line rights-of-way. Although there are no known nesting sites within this area, it is possible that caracaras may in fact nest here. Site specific surveys will be required prior to any construction activity in this area, and the Service's *Habitat Management Guidelines For Audubon's Crested Caracara In Central and Southern Florida* should be consulted during project planning.

Bald eagle

Based on 2001 data, 18 bald eagle nests have been recorded within the project boundaries. Of these, 16 have been active since 1998, and 14 were active in 2001. Construction of STAs within the project area is likely to eliminate bald eagle nesting habitat. Powerlines connected to pumps associated with STAs and canal improvements may also provide a hazard for nesting or roosting eagles. The publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

Eagles are known to utilize a variety of natural and man-made habitat types including much of what exists in the project area. Primary suitable habitat is forested canopies within 1.86 miles of open water. In addition to the forested areas, suitable nest sites include utility and communication transmission towers. This project's STA and reservoir footprints contain approximately 4,300 acres of suitable nesting and foraging habitat, including natural communities of pine flatwoods, mixed wetland hardwoods, cypress, freshwater marsh, mixed wet hardwoods, wetland forest, ponds, temperate hardwoods and wet prairie; and man-made communities such as water bodies and transmission line rights-of-way. Because foraging habitat is not considered a limiting factor for eagles, there should be no adverse effects due to loss of foraging habitat from this project. If the STAs are constructed in their currently proposed locations, approximately 3,100 acres of potential nesting habitat may be affected. The Service's *Habitat Management Guidelines for the Bald Eagle in the Southeast Region* should be consulted during project planning.

West Indian manatee

West Indian manatees are expected to benefit from improved habitat conditions in Lake Worth Lagoon and the Loxahatchee River estuary. Manatees are documented within the project area, including the warm water refuge of the Rivera Beach Power Plant on Lake Worth Lagoon, Lake Worth Lagoon, and the Loxahatchee River. Lake Worth Lagoon and the Loxahatchee River are designated as critical habitat for the manatee. Elements from the C-51 improvements and Lake Worth Lagoon restoration will promote seagrass reestablishment and improve manatee foraging areas. Temporary adverse effects may occur during construction that disturb or injure individual manatees, disrupt feeding or resting areas, block migration routes, or remove palatable vegetation. Future siting of project features will require careful consideration of manatee habitat use to minimize barriers within the species range, and avoid disturbance. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented in areas accessible to manatees.

Manatee access to the canal system within the project area has been blocked, and there is no current usage of these areas, so new water control structures, pumps and culvert construction and modification associated with the C-51, M-canal and L-8 Canal will have no direct effects on manatees. Structure operations may affect manatees through their effects on the downstream

water quality and conditions within the estuaries. Coordination is required between the Service and the Corps concerning structure design, placement and operation to facilitate manatee recovery efforts.

Florida Panther

There have been historical sightings of the Florida panther within the project area, though none of the sightings are more recent than 1987. Due to the wide-ranging nature of the panther, it is possible that at panthers may enter and remain within the project area for a period of time. Two of the proposed water retention areas are within the panther "Core-Other" area, and dependant upon the final locations of these two proposed water retention areas, they may impact up to approximately 4,050 acres of panther habitat (approximately 2,978 acres high value habitat, 96 acres medium value habitat, and 976 acres low value habitat).

Listed plant species

There are six federally listed plant species within the North Palm Beach County project boundaries: beach jacquemontia, Florida perforate cladonia, four-petal pawpaw, tiny polygala, Okeechobee gourd, and Johnson's seagrass. Five of the six species are federally listed as endangered. Johnson's seagrass is listed as threatened.

Cladonia, four-petal pawpaw, beach jacquemontia

It is unlikely that effects from project elements will modify suitable habitat of cladonia, four-petal pawpaw or beach jacquemontia. Cladonia and four-petal pawpaw are restricted in range to scrub locations that are well-drained and structurally open. The major factor contributing to their declining numbers is destruction of habitat by residential housing and commercial activities. If current C&SF Restudy STA and reservoir locations are utilized, habitat for these species will likely not be effected. Beach jacquemontia resides on beach coastal strand and maritime hammocks of barrier islands. Project elements are not located in scrub or the leeward beach dune interface, nor are ancillary effects from construction or maintenance predicted on these species. Even though actual siting for these facilities is forthcoming, it is probable that no potential STA locations would be sited in the xeric communities required by this species.

Tiny polygala

This endangered species is found in areas of scrub, pine rockland, high pine and open coastal spoil. Habitat of these types is found along the coastal ridge in the eastern section of this project area. If current C&SF Restudy STA and reservoir locations are utilized, tiny polygala habitat will likely not be effected. Even though actual siting for these facilities is forthcoming, it is probable that no potential STA locations would be sited in the xeric communities required by this species. Alteration of the xeric conditions and fire regimes along the coastal ridge may

negatively affect potential habitat of tiny polygala. Potential effects to xeric communities from changes in the regional hydrology are unlikely because these habitat are at high elevations.

Okeechobee gourd

Currently the Okeechobee gourd's southern range is restricted to the shoreline around Lake Okeechobee. Destruction of pond apple sloughs for agriculture and stabilized water levels in Lake Okeechobee are two factors attributable to the plants decline. Project elements are not located in gourd habitats, nor are ancillary effects from construction or maintenance predicted on this species.

Johnson's seagrass

Construction of project elements may pose temporary negative effects to water quality due to siltation during the movement of soil while building pump stations, dredging and constructing canals, placing STAs and constructing culverts. These effects can be minimized with proper construction practices and siltation barriers. One of the primary goals of this project is to improve the water quality within the Lake Worth Lagoon and Loxahatchee River estuary. This should improve growing conditions, and likely be a long-term positive effect for seagrasses.

Coordination with the Corps and the District for the North Palm Beach County - Part 1 project

Coordination with the Corps and the District is accomplished through North Palm Beach County PDT meetings and sub-group meetings, Restoration Coordination and Verification (RECOVER) Regional Evaluation Team participation, review of the North Palm Beach County PMP, membership and attendance at the Loxahatchee Coordinating Council, Loxahatchee Watershed Ecological Restoration Technical Committee, and L-8 Test Project Group. Project discussion and information requests for this analysis occurred between the Service and the District Project Manager.

Section 7 consultation

Section 7 consultation has not yet been initiated for this inactive project.

18 North Palm Beach County - Part 2

North Palm Beach County - Part 2 project description

This project includes two separable elements, or sub-projects. The C-51 Regional Groundwater ASR system, and the L-8 Basin ASR system. These projects will provide additional long-term water storage within the North Palm Beach County region.

C-51 Regional Groundwater ASR

The purpose of this project is to capture and store excess flows from the C-51 Canal, currently discharged to the Lake Worth Lagoon, for later use during dry periods.

This project includes a series of ASR wells with a total capacity of 170 mgd, associated pre- and post- water quality treatment to be constructed along the C-51 Canal, and canals that can receive water from the C-51 Canal. The conceptual design assumes 34 well clusters, each with an individual capacity of 5 mgd fed by a combination of vertical and horizontal wells located near existing canals. The conceptual design includes disinfection pre-treatment and post storage aeration. The level and extent of treatment and number of the ASR wells may be modified based on findings from a proposed ASR pilot project.

The ASR facilities will be used to inject and store surficial aquifer ground water adjacent to the C-51 Canal into the upper Floridan Aquifer instead of discharging the canal water to tide. Water will later be returned to the C-51 Canal to help maintain canal stages during the dry season. If water is not available in the ASR system, existing rules for water delivery to this region will be applied.

L-8 Basin ASR

The purpose of this project is to increase water supply availability and to moderate water level within the West Palm Beach Water Catchment Area. It will also provide flows to enhance hydroperiods in the Loxahatchee Slough, increase base flows to the Northwest Fork of the Loxahatchee River, and reduce high discharges to the Lake Worth Lagoon. During periods when the Grassy Waters Preserve is above desirable stages, 50 mgd will be diverted for storage in the ASR wells.

This project includes ASR wells with a total capacity of 50 mgd and associated pre- and post-water quality treatment to be constructed within the L-8 Basin, or along the City of West Palm Beach water supply conveyance and storage system, or a combination of both. The conceptual design consists of 10 wells, each with an individual capacity of 5 mgd for a total capacity of 50 mgd. The conceptual design includes disinfection pre-treatment and post-storage aeration. The level and extent of treatment and number of the ASR wells may be modified based on findings from a proposed ASR pilot project.

Initial effects analysis for the North Palm Beach County - Part 2 project

The footprints of individual ASR wells will be relatively small, on the order of 5 acres each. None of the proposed ASR wells have yet been sited, and the total number of constructed wells also is only theoretical at this time. Given the initial proposal of 44 wells (or well clusters), a very broad estimate of on-the-ground effects would be 220 acres. How many of these acres will represent listed species habitat is open to conjecture at this time, and is completely dependent upon the well locations chosen for various geological and hydrological reasons.

Several listed species occur within northern Palm Beach County and could potentially be effected by ASR well construction and operation. These include: West Indian manatee, Audubon's crested caracara, bald eagle, Everglade snail kite, Florida scrub-jay, red-cockaded woodpecker, wood stork, eastern indigo snake, Florida perforate cladonia, four-petal pawpaw, Johnson's seagrass, Okeechobee gourd, and tiny polygala.

The West Indian manatee may be affected by the operation of these structures and wells and the indirect effects they may have on the coastal waterways. Similarly, effects to Johnson's seagrass may result from changes in the salinity of the water in Loxahatchee estuary and Indian River Lagoon, as well as the timing and duration of freshwater flows into these systems, which may be altered from the operation of these wells. Neither of these species will be directly affected by the construction of the ASR wells.

The caracara, bald eagle, snail kite, wood stork, eastern indigo snake and red-cockaded woodpecker may be directly affected to varying degrees, based upon how much suitable habitat will be found within the proposed well footprints, when they are ultimately determined. The worst case scenario would be a loss of 220 acres of habitat for each of these species. Species that are not likely to be affected include the Florida scrub-jay, Florida perforate cladonia, four-petal pawpaw, Okeechobee gourd and tiny polygala.

Coordination with the Corps and the District for the North Palm Beach County - Part 2 project

Because no project managers have been assigned, coordination of the project description and preliminary effects analysis with the Corps and the District was not possible.

Section 7 consultation

Section 7 consultation has not begun for this inactive project.

20, 21 Palm Beach County Agriculture Reserve Reservoir - Part 1, and Aquifer Storage and Recovery - Part 2

Palm Beach County Agriculture Reserve Reservoir - Part 1, and ASR - Part 2 project description

These projects are located on the east side of the Loxahatchee Refuge and directly south of the Strazulla wetlands in the WPAs (Fig. 20-1).

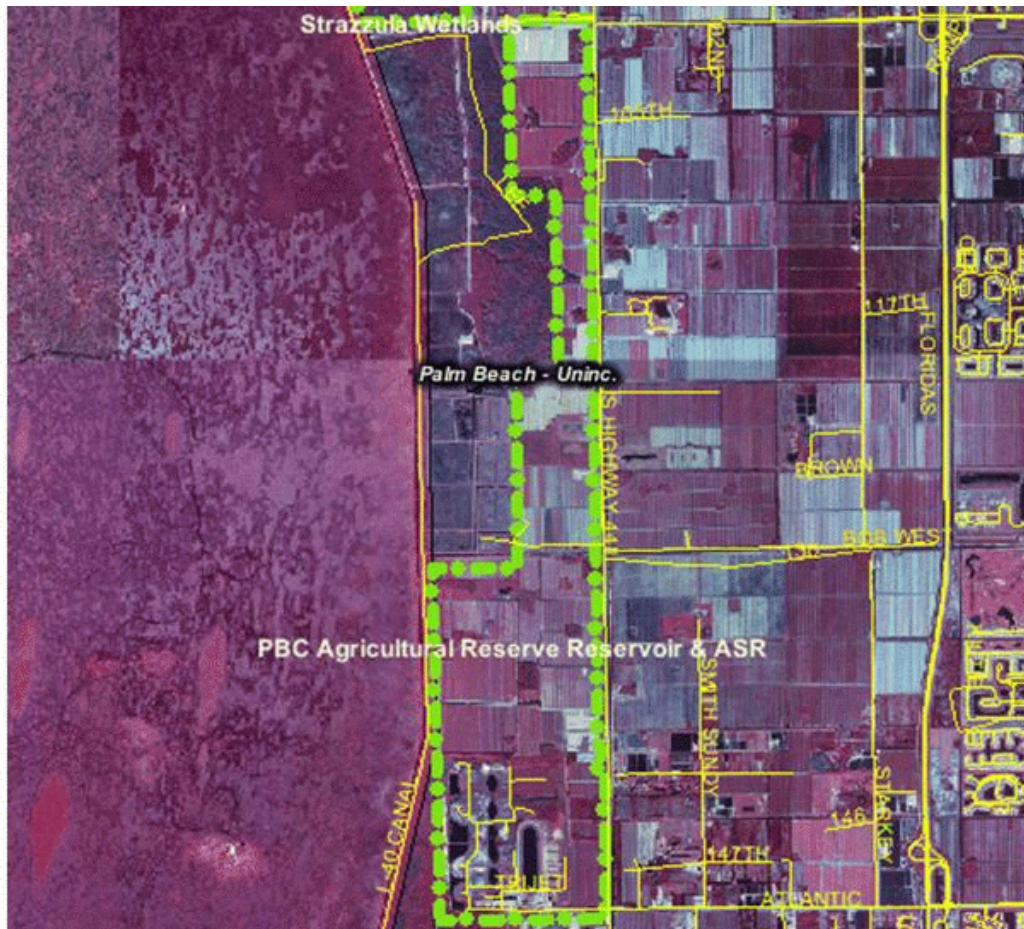


Figure 20-1. Palm Beach County Agricultural Reserve Reservoir and Agricultural Reserve Aquifer Storage and Recovery project area
(http://www.evergladesplan.org/pm/projects/cerp_gis.cfm).

The Palm Beach County Agricultural Reserve Reservoir (PBCARR) - Part 1 project includes an above ground reservoir with a total storage capacity of approximately 20,000 acre-feet located in the western portion of the PBCARR - Part 1. The initial design for the reservoir assumed 1,660 acres with water levels fluctuating up to 12 feet above grade. An inflow pump capacity of 500 cfs, an outflow structure with a 500 cfs capacity, and an emergency outflow structure with a

capacity of 300 cfs are included in the current design plans. We have assumed that acres required for pumps and outflow structures will be included in the 1,660 acre total. The final size, depth and configuration of these facilities will be determined through more detailed planning and design.

The purpose of the project is to supplement water supply deliveries for central and southern Palm Beach County by capturing and storing excess water currently discharged to the Lake Worth Lagoon. These supplemental deliveries will reduce demands on Lake Okeechobee, the WCAs, and the Loxahatchee Refuge. It is assumed that this facility could also be designed to achieve water quality improvements in downstream receiving waters, depending upon pollutant loading conditions in the watershed.

The reservoir will be filled during the wet season with excess water from the western portions of the Lake Worth Drainage District and possibly from Acme Basin B. Water will be returned to the Lake Worth Drainage District canals to help maintain canal stages during the dry-season. Regional water will be supplied to the Lake Worth Drainage District when water levels fall below 15.8 feet National Geodetic Vertical Datum (NGVD). Water will be back-pumped into the reservoir when water levels are above 16.0 feet NGVD. Water will be supplied from the reservoir first before tapping into the PBCARR ASR.

The PBCARR - ASR Part 2 project includes ASR wells with a total capacity of 75 mgd and associated pre- and post- water quality treatment located adjacent to the reservoir. The initial design for the ASR assumed 15 well clusters, each with a capacity of 5 mgd as well as chlorination for pre-treatment and aeration for post-treatment. The 15 ASR wells would require approximately 75 acres of surface area. The source of water to be injected is surficial ground water adjacent to the PBCARR that is currently discharged to tide. The level and extent of treatment and number of the ASR wells may be modified based on findings from a proposed ASR pilot project. Since the PBCARR Part 2 ASR project will be constructed after the PBCARR Part 1 project, and on the existing footprint of the Part 1 project, the effects of Part 2 will, likely, be addressed during design and coordination on PBCARR - Part 1.

Over 60 percent of the parcel is comprised of row crops, tree nurseries, or other agriculture with scattered cypress domes and other forested wetlands. These forested systems could provide roosting or nesting habitat for wood storks, snail kites, and colonial wading birds. The Strazulla wetlands lie to the west between the PBCARR - Part 1 and the Loxahatchee Refuge. The Loxahatchee Refuge is managed by the Service for fish and wildlife resources including endangered and threatened species and is entirely within designated critical habitat for the Everglade snail kite.

Initial effects analysis for the Palm Beach County Agriculture Reserve Reservoir - Part 1, and ASR - Part 2 project

Federally listed species that could potentially be affected by the PBCARR - Part 1 Project include the Everglade snail kite, wood stork, bald eagle, and eastern indigo snake. A GIS analysis of the project footprint and corresponding FLUCCS codes resulted in the following estimates of effects to listed species (see Table 20-1):

Wood stork

Harm/Harass: A wood stork colony and numerous wood stork location points exist within 5 miles of the proposed project in the Loxahatchee Refuge. Approximately 31 acres of small reservoirs currently exist on the site. The proximity of these reservoirs to the wood stork data points on the Loxahatchee NWR indicates the small reservoirs may be used by this species for foraging. Loss of the cypress and other forested wetlands within the footprint could eliminate nesting and roosting opportunities for avian species like the wood stork. Constructing the reservoir to include tree islands could minimize this effect. Loss of useable habitat: 1,348 acres.

Benefit: Because littoral shelves that would concentrate fish are not currently part of the project plans, no new habitat will be counted. If littoral shelves were added, approximately 27 acres of foraging habitat could be created.

Conservation Measures: Since wood storks forage in the vicinity of the proposed project, the Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning to minimize potential adverse effects through measures that may include limited or no nighttime work.

Everglade snail kite

Harm: Loss of useable habitat: 182 acres, including one acre of existing reservoir perimeter.

Benefit: Creation of approximately 30 acres of reservoir perimeter foraging habitat.

Conservation Measures: Conservation measures designed to minimize effects on the wood stork will also benefit the snail kite.

Table 20-1. Breakdown of acres for each land use type within the Palm Beach County Agriculture Reserve Reservoir - Part 1 project footprint.

Land Use Description	Flucs_lev 3 code	Acres	Indigo Snake	Wood Stork	Snail Kite	Bald Eagle
Fixed Single Family Units	111	9.3	9.3			
Inactive Land with street pattern but without structures	192	193.8	193.8			
Row Crops	214	1,165.9	1,165.9	1,165.9		
Tree Nurseries	241	12.3	12.3			
Ornamentals	243	20.4	20.4			
Horse Farms	251	72.1	72.1			
Other	259	14.9	14.9			
Fallow Crop Land	261	1.1	1.1			
Other Shrubs and Brush	329	1.4	1.4			
Brazilian Pepper	422	60.1	60.1			
Melaleuca	424	42.0	42.0			
Australian Pines	437	7.7	7.7			
Reservoirs larger than 10 acres but less than 100 acres	533	22.4		0.6	0.6	22.4
Reservoirs less than 10 acres which are dominant features	534	37.6		2.1	2.1	37.6
Mixed Wetland Hardwoods	617	34.8	34.2	34.2	34.2	34.2
Cypress	621	22.5	22.5	22.5	22.5	22.5
Wetland Forested Mixed	630	95.1	95.1	95.1	95.1	95.1
Rural land in transition - unknown activity	741	9.1	9.9			
Electrical Power Transmission Lines	832	137.7	137.7			
Mixed Shrubs	6172	27.6	27.6	27.6	27.6	27.6
ACRES		1,988.0	1,927.3	1,348.1	182.2	239.4

Bald eagle

Harm: Loss of useable habitat: 239 acres.

Benefit: Creation of approximately 1,660 acres of deep-water reservoir habitat post project. Use of the site by bald eagles will be dependent on operations of the PBCARR.

Conservation Measures: While the proposed project is not located within the Primary or Secondary Zone of any bald eagle nest, habitat suitable for this species is present and the Service's *Habitat Management Guidelines for the Bald Eagle in the Southeast Region* should be consulted during project planning.

Florida panther

Palm Beach County was historically part of the home range for the Florida panther. Radio collared individuals have been confirmed in more recent years within the county limits.

Potential Harm: The project site is predominantly row crops. While this is low panther habitat, it could potentially provide foraging habitat for white tailed deer which is important prey for the panther. Conversion of 1988 acres of primarily agriculture land to a reservoir occupying 1,660 acres may constitute a loss of high, medium, and low panther habitat. Out of the existing 1988 acres of existing land, 416 acres have no value to the panther, 1,390 acres have low value, two acres have medium value, and 180 acres have high value. Approximately 714 acres of this total occur within the panther "Core, Other" area. Although only 1,660 acres of this total site will be impacted by the PBCARR, we assumed in a worst-case scenario that all of the area within the panther Core would be converted to a reservoir with no value to panthers.

Benefit: A reduction in high nutrients and contaminants related to agriculture may increase habitat quality in the adjacent Loxahatchee NWR and Strazulla wetlands, thus creating more suitable habitat for the panther and prey. The reservoir will act as a buffer between existing conservation lands (Loxahatchee and Strazulla) and development and agriculture lands, thus buffering panthers and prey species from human activity.

Eastern indigo snake

Harm/Harass: Since the wetlands present are surrounded by row crops that undergo frequent plowing and discing, little habitat may be available for eastern indigo snakes in the pre-project condition. However, row crops do provide habitat for lizards, frogs, palmetto bugs, small mammals, and other prey items for this species. The elimination of the row crops could affect eastern indigo snakes by limiting foraging opportunities to the perimeter of the reservoir. Loss of useable habitat: 1,660 acres of reservoir. Indigo snakes could also be directly harmed or harassed during construction activities.

Benefit: Creation of approximately 48 acres of levee habitat available for use by this species post-construction, assuming a reservoir of 1,660 acres with 12 feet of water storage and a 2:1 slope on the surrounding levee. In addition, the balance of the site, as much as 327.8 acres depending on final design, would be available for use by the eastern indigo snake.

Conservation Measures: The Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Coordination with Corps and the District for the Palm Beach County Agriculture Reserve Reservoir - Part 1, and ASR - Part 2 projects

The PBCARR Part 1 Reservoir project is not active and no Corps lead has been designated. The project is scheduled to begin planning in December 2005. The Part 2 ASR project is also inactive and is scheduled to begin planning in May 2009.

Section 7 consultation

There is no history of consultation on either of these inactive projects.

Hillsboro ASR project description

This project will use ASR technology to augment water supply and maintain operational canal stages. A pilot project evaluating the feasibility of using ASR for this purpose will be conducted before the full size ASR project is planned or designed. The results of the pilot project will determine the size and configuration of the well clusters and the size and type of treatment facilities required. Due to the preliminary nature of the project and its dependence on the results of the pilot project, analysis is based on the information contained in the Restudy and from discussions with Corps project managers and engineers. This is an estimate only and is likely to change as the project becomes further defined.

The project includes a series of ASR wells with a total capacity of approximately 150 mgd and associated pre- and post- water quality treatment which will be located in southern Palm Beach county adjacent to the Site 1 reservoir or along the Hillsboro Canal (Fig. 22-1) near the Hillsboro ASR pilot project. The initial design of the ASR facility assumed 30 well clusters into the upper Floridan Aquifer System, each with a capacity of 5 mgd with chlorination for pre-treatment and aeration for post-treatment. The Site 1 Impoundment will be a potential source of injected water as well as surficial groundwater near the reservoir. The location, extent of treatment, and final number of the ASR wells may be modified based on findings from the pilot project.

The purpose of this project is to supplement water deliveries to the Hillsboro Canal during dry periods thereby reducing demands on Lake Okeechobee and the Loxahatchee Refuge. Water will be pumped into the aquifer during the wet season or periods when excess water is available. Water will be released back to the reservoir or Hillsboro Canal to help maintain canal stages during the dry season.

Initial effects analysis for the Hillsboro ASR project

Information regarding the habitat requirements and potential presence of threatened and endangered species was taken from the MSRP. Wood stork colony locations were obtained from the Loxahatchee Refuge database. Based on the pilot project, treatment facilities are estimated to require 5 acres per well (Rebecca Weiss, Corps, personal communication 2003). Using this information, a conservative estimate of 150 acres for the full scale project was evaluated for effects to threatened and endangered species.

Wood stork

Harass: Construction of surface treatment facilities may eliminate foraging habitat within the 18.6-mile CFA of wood storks nesting at colonies in WCA 1 and WCA 2. At this time, there is no information regarding the location of the surface treatment facilities so detailed analysis of habitat loss is not possible. A worst case scenario would be 150 acres of habitat lost. The Service's *Habitat Management Guidelines for the Wood Stork in*

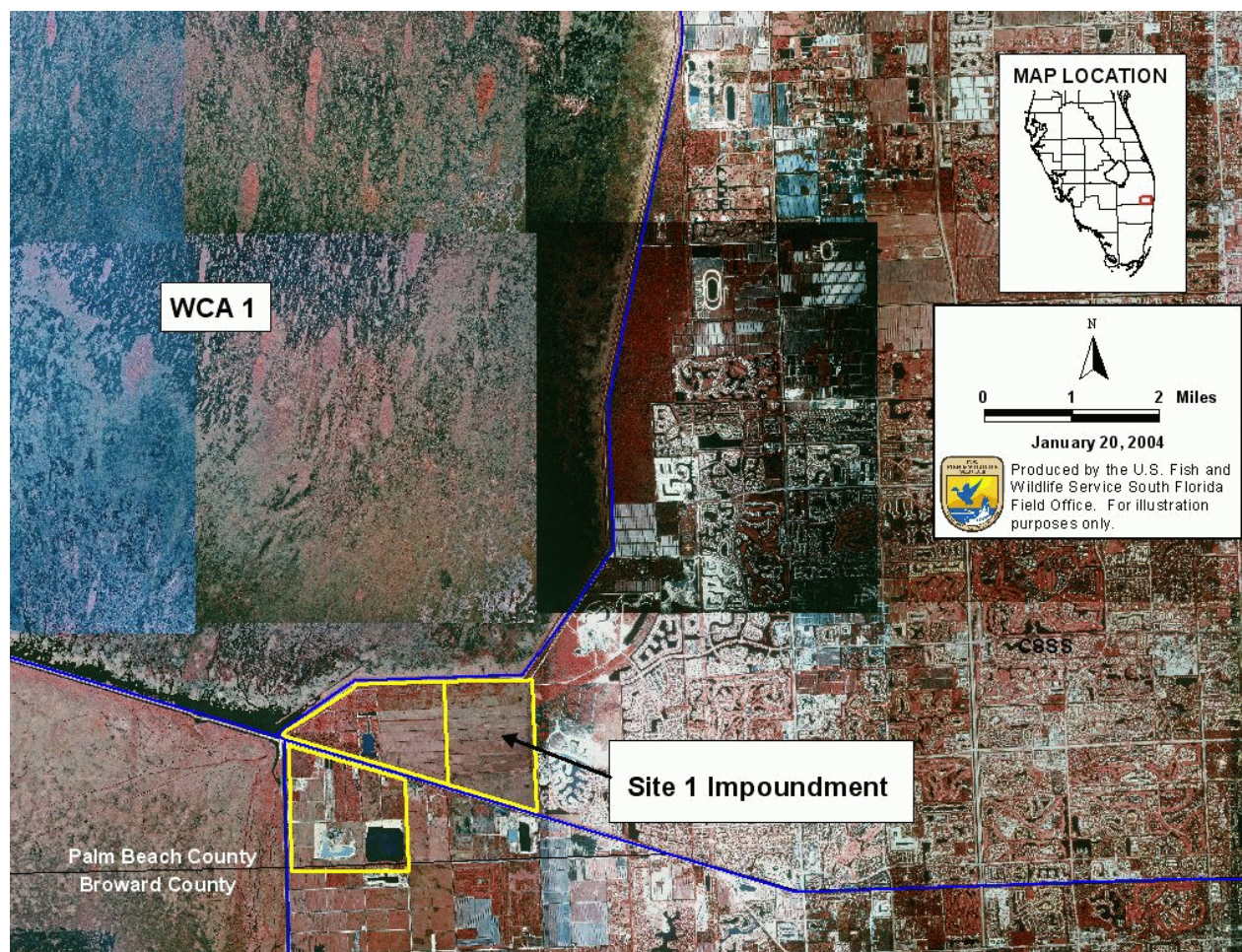


Figure 22-1. Project area for Hillsboro Aquifer Storage and Recovery. The project includes a series of Aquifer Storage and Recovery wells with a total capacity of approximately 150 mgd and associated pre- and post- water quality treatment which will be located in southern Palm Beach county adjacent to the Site 1 reservoir or along the Hillsboro Canal.

the Southeast Region and U.S. Fish and Wildlife Service Supplemental Habitat Guidelines for the Wood Storks in the South Florida Ecological Services Consultation Area should be consulted during project planning.

Eastern indigo snake

Harm: Approximately 150 acres of habitat would be lost to the construction of water treatment facilities. Indigo snakes could be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Coordination with the Corps and the District for the Hillsboro ASR project

March 18, 2003. Telephone conversation with Steve Sutterfield, Corps, to discuss project features.

March 25, 2003. Email from Glenn Landers, Corps.

March 25, 2003. Telephone conversation with Rebecca Weiss, Corps, to discuss treatment facility footprint.

Section 7 consultation

Consultation has not begun on this inactive project.

23 Flows to Eastern Water Conservation Area 3B

Flows to Eastern WCA 3B project description

The purpose of the project is to deliver excess surface water and seepage from WCA 2B, 3A, and 3B stored in the Central Lake Belt Storage Area, to eastern WCA 3B, as needed to meet downstream demands.

The project includes a 500-cfs pump from L-30 to the eastern portion of WCA 3B. A spreader swale along eastern WCA 3B would convert the 500-cfs outflow to sheetflow. The discharge point from the L-30 borrow canal to WCA 3B is at the bend in the canal and is approximately 4.5 miles south of the intersection of the L-30 and the C-6 Canal in Miami-Dade County (Fig. 23-1). The operation of the project would attempt to provide deliveries that would maintain 6-inch depths in WCA 3B if Natural System Model hydroperiods indicate WCA 3B water levels should be at or above 6 inches and if water is available in the Central Lake Belt Storage Area. Water would be delivered from the Central Lake Belt Storage Area through a wetland treatment cell and the L-30 borrow canal to a spreader swale system in eastern WCA 3B. The project prioritizes the use of Central Lake Belt Storage Area water and would incorporate telemetry systems for all operable structures and pump stations.

Project Footprint

The project footprint would include the area necessary to construct the pumping station and the spreader canal. Although the exact dimensions have not yet been determined, the spreader canal is estimated to encompass an area approximately 50 feet in width and 1.5 miles in length. The total area that could be disturbed by these two components is estimated to be 10 acres.

Initial effects analysis for the Flows to Eastern WCA 3B project

Wood stork

None of the footprint of the Flows to Eastern WCA 3B Project is within the Primary or Secondary Zones for known wood stork colonies; however, all of the footprint for the project is within the 18.6-mile CFA of documented wood stork nesting colonies outside the project area. Construction of the spreader canal would convert approximately 9 acres of wetland habitat to open water habitat unsuitable for storks.

Everglade snail kite

No designated critical habitat or documented nesting sites for the snail kite are found within the Flows to Eastern WCA 3B Project footprint; however, there is suitable habitat for the Everglade snail kite in the project footprint. Construction of the spreader canal would convert approximately 9 acres of wetland habitat to open water habitat that would not be suitable for snail kites.

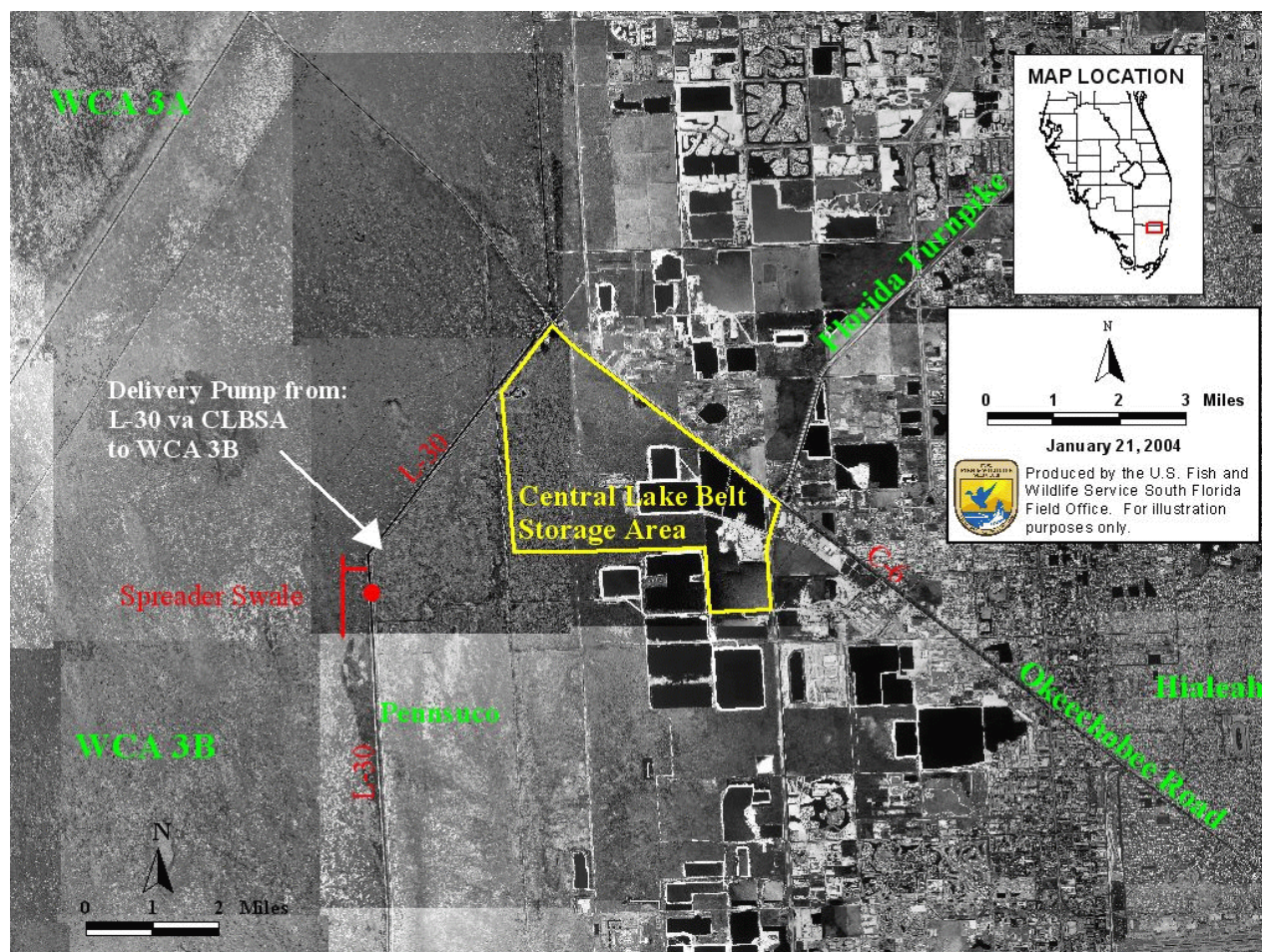


Figure 23-1. Location and major features of the Flows to Eastern Water Conservation Area 3B Project. The project includes a 500-cfs pump from L-30 to the eastern portion of WCA 3B. A spreader swale along eastern WCA 3B would convert the 500-cfs outflow to sheetflow. The discharge point from the L-30 borrow canal to WCA 3B is at the bend in the canal and is approximately 4.5 miles south of the intersection of the L-30 and the C-6 Canal in Miami-Dade County.

Eastern indigo snake

All of the potential Flows to Eastern WCA 3B Project footprint can be considered suitable eastern indigo snake habitat. Construction of the worst-case scenario would impact a total of 10 acres of the immediate levee and wetlands area in the project footprint. Indigo snakes could be directly harmed or harassed during construction activities and road mortality could occur if the levee is used for equipment access to the construction area. The Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Florida panther

The Flows to Eastern WCA 3B Project location footprint is within the designated Primary/Dispersal Zone for the Florida panther. The habitat types associated with this project (levee bank with grass, forbs, small shrubs, and wetlands) are considered high-quality for Florida panthers. Assuming some panther use may occur now or in the future in the project area, the project could have a maximum potential impact of 10 acres.

Bald eagle

No recent bald eagle nesting activity has been recorded in the Flows to Eastern WCA 3B Project footprint. The habitat types associated with the project footprint are not considered foraging habitat for bald eagles. If new electrical lines will be needed associated with the installation of pumps near open water, the publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

West Indian manatee

Construction within the project footprint could effect the manatee at the location of any new pumps, intake pipes, and outfall structures constructed for the project on the L-30 canal. Manatees have infrequently been documented moving into the L-30 canal, apparently through the Lake Okeechobee system by way of the L-33, L-30, and L-31N canals. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during project construction to ensure minimal or no disturbance to manatees during construction. Structure operations could also trap or crush manatees and the installation and operation of manatee exclusion devices at the pump station should minimize the possibility of take during pump operation. A multi-agency team is developing additional guidance for structure design and manatee access.

Coordination with Corps and the District for the Flows to Eastern WCA 3B project

This project is inactive. Planning is scheduled to begin in March 2011.

Section 7 consultation

There is no history of consultation on this inactive project.

24 Broward County Secondary Canal System

Broward County Secondary Canal System project description

As described in the Restudy and the *Draft WPA Feasibility Report*, the purpose of this project is to increase the pump capacity of existing facilities and construct additional canal and pump facilities for the Broward County Secondary Canal System. These features will provide recharge to Wellfield located in central and southern coastal Broward County, stabilize the salt water interface, and reduce storm water discharges to tide (Fig. 24-1). This project includes a series of water control structures, pumps, and canal improvements located in the C-9, C-12 and C-13 canal basins and the east basin of the North New River Canal in central and southern Broward County (Fig. 24-2).

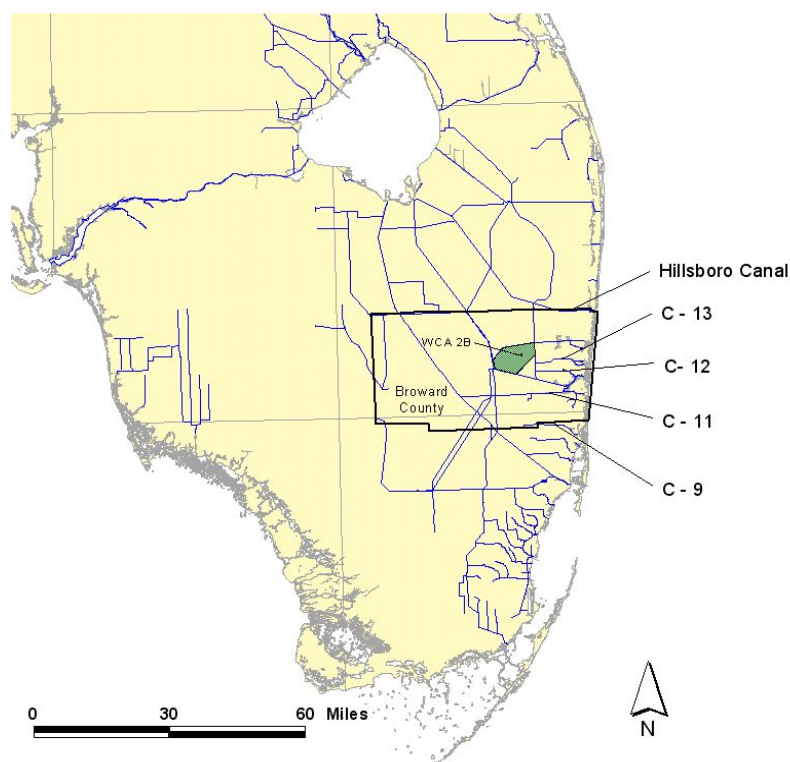


Figure 24-1. Location of Broward County Secondary Canal System project. This project includes a series of water control structures, pumps, and canal improvements located in the C-9, C-12 and C-13 canal basins and the east basin of the North New River Canal in central and southern Broward County

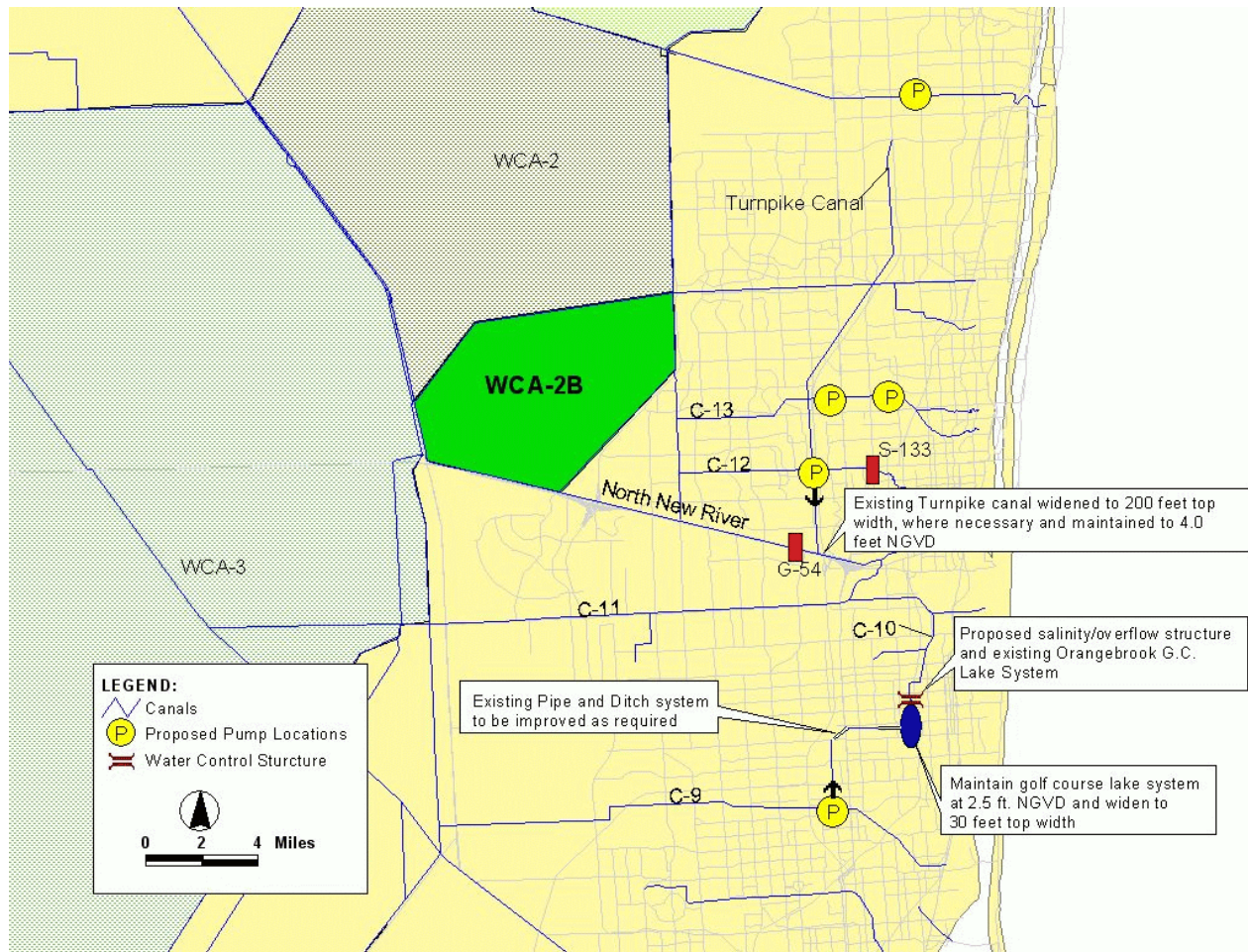


Figure 24-2. Proposed design and pump locations for the Broward County Secondary Canal System project.

Maintained secondary canals will include Broward County's C-2 from the Hillsboro Canal, the north secondary canal from C-13, the south secondary canal from C-13, the Turnpike canal south from C-12, and the canal north from C-9 (added in Alternative 5). Excess water in the basins will be pumped into the coastal canal systems to maintain canal stages at optimum levels. When basin water is not sufficient to maintain canal stages, the canals will be maintained from other sources such as Hillsboro Impoundment, North Lake Belt Storage Area, Lake Okeechobee and the WCAs.

Canal conveyance of the secondary canal located east of the Florida Turnpike from the C-12 Canal south to the Fort Lauderdale Golf and Country Club will be improved. Alternative 5 includes routing of water eastward to recharge the aquifer and help stabilize the saltwater

interface in Fort Lauderdale. Canal conveyance improvements may also be necessary in southeastern Broward County and for the Old Plantation Water Control District's eastern canal.

Capacities of the proposed pumps are 100 cfs at the junctions of the Hillsboro and Broward County Secondary Canal, C-13 north and the Broward County Secondary Canal, C-13 south and the Broward County Secondary Canal (described in the 2050 Base as increased from 33 cfs to 100 cfs), and on the east Turnpike canal withdrawing water from the C-12 Canal. A 150-cfs pump is proposed on the C-9 canal for maintaining water in southeastern Broward County (Fig. 24-2) .

East and west Turnpike canals and the golf course lake system will be improved between C-12 and the North New River to achieve an average top width of 200 feet. The Turnpike canals will be maintained at a minimum elevation of 4.0 feet NGVD. Canal and lake systems in southeastern Broward County and the Orangebrook Golf Course will be improved to have an average canal top width of 30 feet. The southeastern Broward Canal system will be maintained at a minimum elevation of 2.5 feet NGVD.

Canal levels are assumed to be maintained from local basin runoff and sources. When water is not available from local sources, it will be supplied to the canal systems from the regional system. It is assumed that canal operations will not impact existing flood control levels.

Project access to structures will be accomplished using existing roads and levees. For structures integrated into a levee or impoundment embankment, access will be along the levee top.

Initial effects analysis for the Broward County Secondary Canal System project

Wood stork colonies and CFAs, manatee mortalities, and Broward County Secondary Canal System water control structures are depicted in Fig. 24-3.

Wood stork

Structures for this feature lie within the CFAs of two known wood stork colonies. Canal water depths and side slopes will determine the extent to which wood storks can effectively forage along or within the improved canals. Proposed pump locations and canal improvements occur in urban-dominated areas. More detailed information regarding canal improvement design is not available at this time and we have assumed for purposes of this report that canals do not provide foraging habitat. The Service suggests designing canal improvements to provide suitable foraging habitat for wood storks on canal edges, when possible.

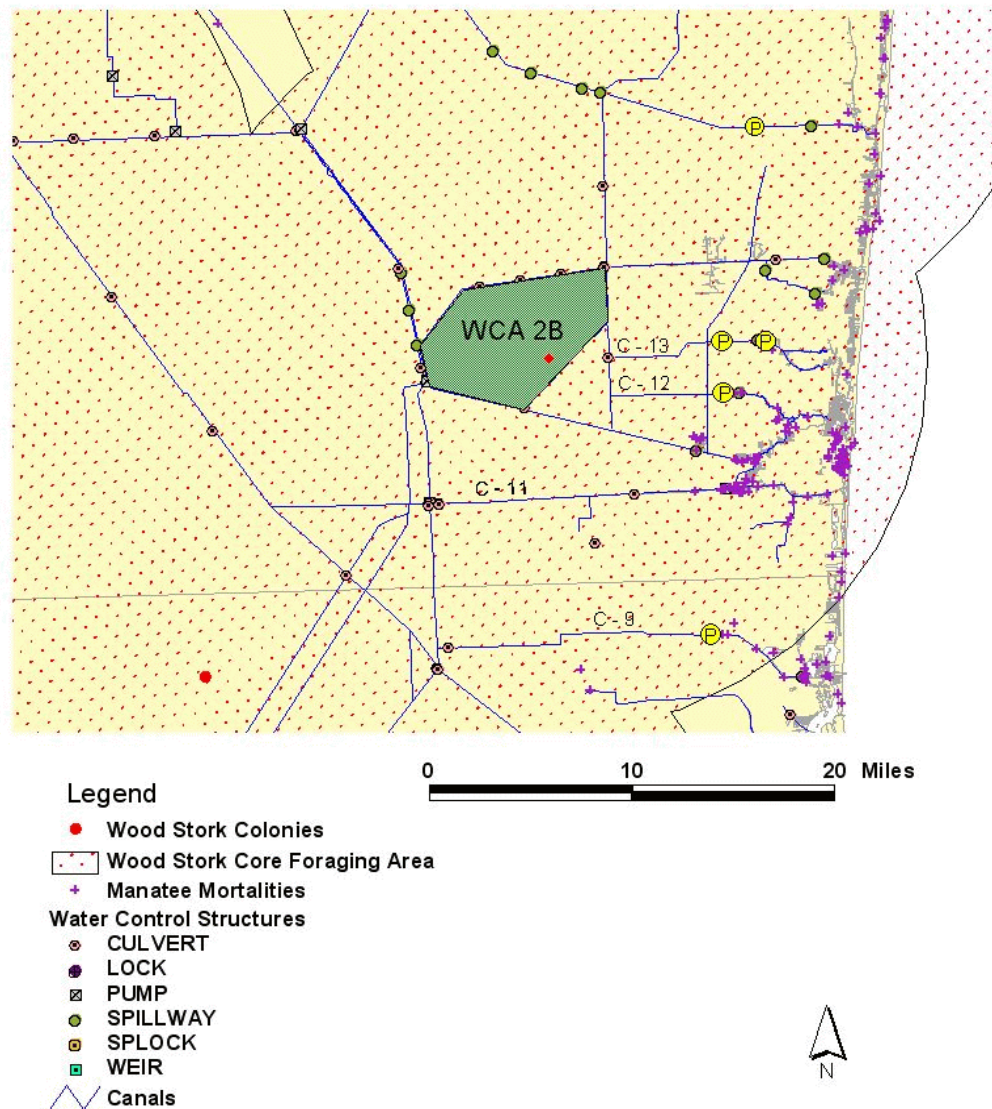


Figure 24-3. Threatened and endangered species and structures associated with the Broward County Secondary Canal System project.

Eastern indigo snake

The indigo snake is a likely inhabitant of the project area, due to the presence of potentially suitable habitat. Based on this assumption, the Service's *Standard Protection Measures for the Eastern Indigo Snake* will be included in the environmental protection plan when the Corps proceeds to the plans and specifications phase for the project. Standard precautions should be implemented during construction, avoiding direct effects. Detailed information regarding canal

improvement design is not available at this time. It can be estimated that the east and west Turnpike canal improvements will effect approximately 76 acres of potentially suitable habitat. West Indian manatee

Manatees are known to reach and be killed or injured at inland water control structures. Both the Service and Corps are part of a multi-agency effort to eliminate this threat. New pump structures in the Hillsboro, C-13, C-12, and C-9 canals should be fitted with grates. Further guidance for structure design and manatee conservation is being developed by a multi-agency team. Construction activities within canals used by manatees may disturb or injure manatees. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented in areas accessible to manatees.

Bald eagle

Eagles, especially juveniles, perch on power lines and towers, particularly if these structures provide the highest vantage points in the area (Avian Power Line Interaction Committee 1996). Thus, for new structures requiring power near open water (*i.e.*, pump stations) the *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocutions.

Coordination with the Corps and the District for the Broward County Secondary Canal System project

September 5, 2002. WPA PDT meeting announcing separation of project into 9 distinct projects/PIRs.

October 2, 2002. Site visit with the District.

November 9, 2002. Project overview meeting with the District.

March 24, 2003. Exchanged e-mail with Corps pertaining to project description.

February 28 and March 3, 5, 11, 14, 26, 27, 2003. Exchanged e-mails with the District pertaining to project description.

Section 7 consultation history

On September 23, 2000, the Corps initiated informal section 7 consultation by letter for the original WPA project configuration, which included Broward County Secondary Canal System. The consultation was based the Water Preserve Areas feasibility study and includes all WPA project components in Palm Beach, Broward, and Miami-Dade Counties, encompassing a significantly larger project description and included effects analysis of threatened and endangered species for all components.

On October 24, 2000, the Service provided a letter to the Corps including a list of species which could be affected by the project. In that correspondence, the Service recommended that the Corps continue informal consultation throughout the preliminary planning process as design iterations were evaluated.

On March 21, 2001, following selection of the plan, the Corps forwarded a biological assessment by letter. The biological assessment considered potential effects on the following species: West Indian manatee, snail kite, wood stork, Cape Sable seaside sparrow, and eastern indigo snake. The Corps determined that the WPA project is not likely to adversely affect any of the considered species or adversely modify critical habitat.

On April 18, 2001, the Service concurred by letter with the Corps determination. This concurrence covered the physical layout of the selected plan and considered the range of operations as modeled in the PSP (Pre Selected Plan) and PSPS 1234 (Pre Selected Plan Scenarios) regional water model simulations. The Service recommended reinitiation of consultation on the snail kite, wood stork, and Cape Sable seaside sparrow once a more detailed operational plan is proposed for the WPA project.

25 North Lake Belt Storage Area

North Lake Belt Storage Area project description

This project is located between S.R. 821, the West Dade Expressway, and U.S. 27/S.R. 25 in northern Miami-Dade County, Florida (Fig. 25-1). WCA 3B lies to the west.

This 4,500-acre in-ground reservoir is designed to capture a portion of runoff from the C-6, western C-11, and C-9 Basins. The in-ground reservoir, with perimeter subterranean seepage barrier, would allow storage of untreated runoff without concerns of groundwater contamination. The stored water would be used to maintain stages in the C-9, C-6, C-7, C-4, and C-2 Canals during the dry season and to provide deliveries to Biscayne Bay to aid in meeting salinity targets. An additional 1,250 acres of STAs is included in this component.

The project includes canals, pumps, water control structures, and an in-ground storage reservoir with a total capacity of approximately 90,000 acre-feet. The initial design of the reservoir assumed 4,500 acres with water levels fluctuating from ground level to 20 feet below grade. A subterranean seepage barrier would be constructed around the perimeter to enable draw down during dry periods, to prevent seepage losses, and to prevent water quality effects due to the high transmission ability of the Biscayne Aquifer in the area. The reservoir would be located within an area in the process of being mined and proposed for additional rock mining. It is assumed that the STA and associated pumps, structures, and canals would be located in an area that will not be rock mined. A detailed description of pumps, water control structures, canals and other infrastructure is not possible at this stage of the planning. The potential acres that would be occupied by these structures would be small and we have assumed this is included in the total project acres estimated at 5,750 acres. The amount of rock mining that occurs previous to construction, and therefore will not be attributable as an impact from CERP, is estimated in the project footprint section of this report.

Inflows from the C-6 (west of the turnpike), western C-11, and C-9 Basins runoff would be pumped and gravity fed into the in-ground reservoir. Inflow would cease when stages reach approximately 5.0 feet NGVD (0 feet above adjacent land elevation). Outflows for water supply would be pumped to the C-9 STA prior to delivery to the C-9, C-6, C-7, C-4, and C-2 Canals. Water from the reservoir could be withdrawn down to a stage of approximately -15 feet NGVD up to 20 feet of working storage and maximum head on seepage barrier).

If water levels in the North Lake Belt Storage Area are from between +5.0 feet NGVD and 0.0 feet NGVD, flows would be discharged to Biscayne Bay via the C-2 Canal. If water levels in the North Lake Belt Storage Area are from between -10 feet NGVD and 0.0 feet NGVD, flows would be discharged to the C-9, C-6, C-7, C-4, and C-2 Canals only to prevent saltwater intrusion. If water levels in the North Lake Belt Storage Area drop to levels between -15 feet NGVD and -10.0 feet NGVD, flows would be limited to discharge to the C-9 Canal only to avoid water shortage restrictions.

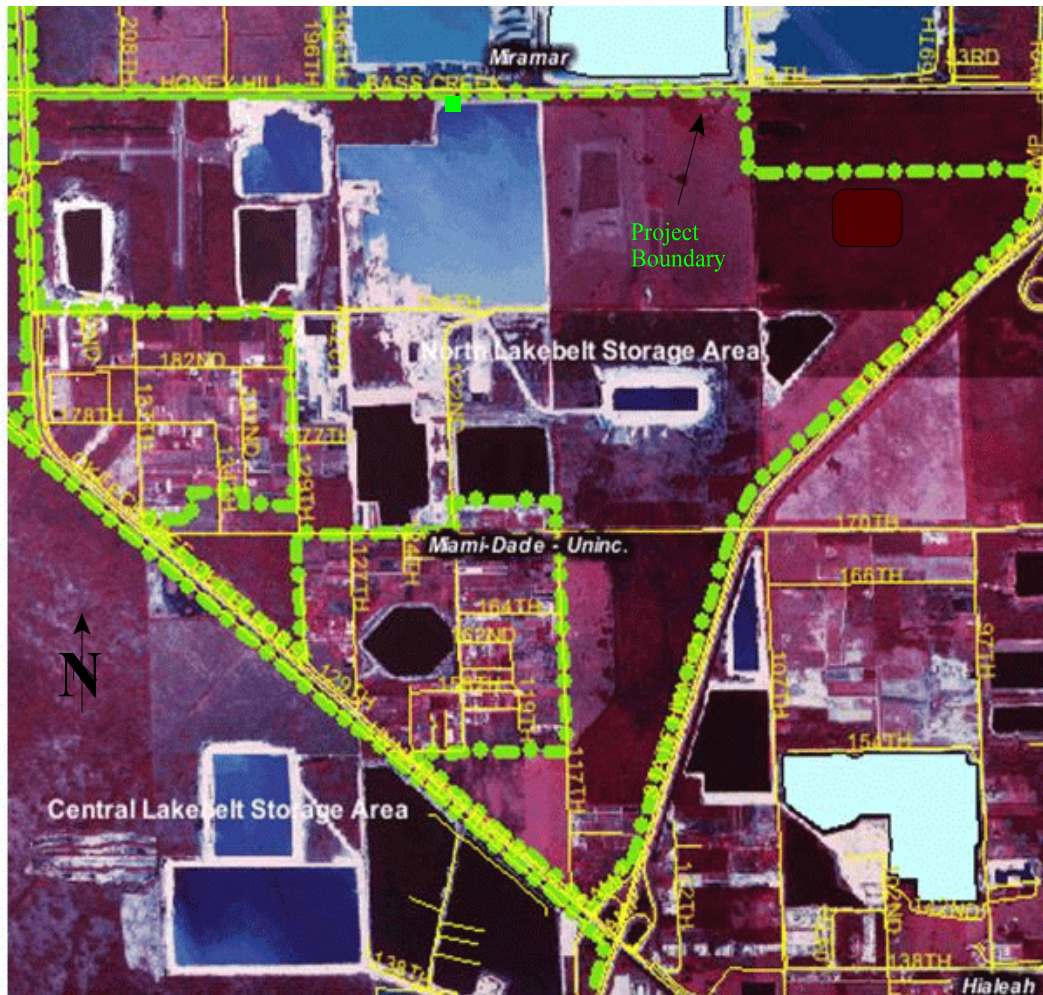


Figure 25-1. North Lake Belt Storage Area project area (not to scale). The 4,500-acre in-ground reservoir is designed to capture a portion of runoff from the C-6, western C-11, and C-9 Basins. (<http://www.evergladesplan.org/pm/projects/cerp_gis.cfm>).

A pilot test would be conducted prior to final design to determine construction technologies, storage efficiencies, impacts upon local hydrology, and water quality effects. The water quality assessment would include a determination as to whether the in-ground reservoir with perimeter seepage barrier would allow storage of untreated runoff. The final size, depth, and configuration of these facilities, including treatment facilities, would be determined through more detailed planning and design.

A number of assumptions will be taken into consideration during final design of this project. These assumptions include:

- a. There will be no adverse effect of a subterranean wall on Miami-Dade County's Northwest Wellfield.
- b. Treatment facilities are needed if stored water is backpumped to the Everglades.
- c. All water quality considerations will be addressed regarding releases from the reservoir to the water supply well field.
- d. There will be no impact on the cone of influence of the Northwest Well field and its effect on wetland mitigation around the well field.
- e. A limestone filter treatment system within the reservoir may be developed through use of compartmentalization of rockmining excavation pattern.
- f. Telemetry systems will be required for all operable structures and pump stations.
- g. Any specific water quality considerations regarding capture of C-6 Basin runoff will be addressed during the detailed design stage.

The estimated current land use or vegetative classification in the potential total project acres of 5,750 acres is detailed in Table 25-1.

Table 25-1. Land use/classification, percent of total, and number of acres within the North Lake Belt Area project.

Land Use/Classification	Percent of Total Project Acres	Number of Acres
Developed	8	460
Disturbed	16	920
Agriculture	21	1,208
Lake/Quarry	7	402
Dense Melaleuca Forest 75-100%	29	1,668
Dense Melaleuca Saplings 75-100%	10	575
Disturbed Prairie with Melaleuca 50-75%	5	288
Prairie with Melaleuca 50-75%	2	115
Disturbed Prairie w/Melaleuca 10-50%	2	114
Total	100	5,790

Project Footprint

The project footprint is estimated to impact the entire acreage detailed above with either impoundment, levee, canal, or pump and piping facilities. Acres currently detailed within the lake and quarry classification will likely not change its land use and classification. The current schedule for the project is to begin construction for the project in 2013 with construction completed in 2036. Currently, 402 of a total of 5,750 acres has been mined. Additionally, approximately 330 acres of land on average is being mined each year within all of the Lake Belt mining sites at the current rate; however, the rate and location of mining is dependent on demand, which will vary considerably. The North Lake Belt Storage Project area represents approximately 15 percent of the total acres approved for mining in the Lake Belt region. This rate would represent an estimated 50 acres per year of further mining in the North Lake Belt area or approximately 500 acres of additional mining before project construction commences in 2013. The pre-project impacts can thus be estimated as a combination of currently mined area (402 acres) plus approximately 500 additional acres projected to be mined before 2013. Therefore, the pre-project acres to be mined represents an estimated nine percent of the total. This would reduce the project footprint impacts attributable to the CERP project by the 500 acres projected pre project, (minus the current acres of lake and quarry habitat, 402 acres from Table 25-1, by nine percent to 4,848 acres.

Initial effects analysis for the North Lake Belt Storage Area project

Federally listed species that could potentially be affected by the North Lake Belt Storage Area Project include the Everglade snail kite, wood stork, bald eagle, and eastern indigo snake. Based on available information, there are no confirmed nest sites, rookeries, or den sites for listed species within the existing potential project footprint. For purposes of determining effected habitat acres it will be assumed that estimated additional mining effects projected to occur before impacts attributable to the CERP project commence detailed above will be distributed equally across all habitat types. Therefore a factor of 9 percent will be subtracted from all habitat calculations.

At this point in the planning process, it is difficult to provide detailed comments on threatened or endangered species issues or on other wildlife and environmental issues. Our comments are therefore more general in nature at this point, and will be developed in greater detail as the process is completed in the form of additional PALs and a FWCA Report, as well as the required consultation under the ESA. Additional planning is essential once the final project plan and sites are selected. Portions of information regarding listed species were garnered from the MSRP.

Wood stork

None of the footprint acres for the North Lake Belt Area Project is within the Primary or Secondary Zones of known wood stork colonies. All of the footprint acres for the North Lake Belt Area Project is within the 18.6-mile CFA of documented wood stork nesting colonies

outside the project area, with various degrees of value as wood stork foraging habitat. The Dade County Lake Belt Plan: Wildlife Study (Dalrymple and Dalrymple, 1996) recorded one observation of wood stork use over a 24-month period in 50 to 75 percent melaleuca cover type and no recorded observations in the 75 to 100 percent melaleuca cover type. Plant communities classified as disturbed prairie, prairie with 10 to 50 percent melaleuca cover, and disturbed prairie with 10 to 50 percent melaleuca cover, and exhibiting a long hydroperiod represent the best available wood stork habitat within the project footprint. These cover types total an estimated 114 acres, so by applying the 9 percent reduction in habitat value, these represent 104 acres that may be effected by CERP. The footprint that would be required to construct the maximum size project reservoir could have negative effects on this potential wood stork habitat. If 100-foot wide littoral shelves (similar to those currently required as part of mitigation for Lake Belt mining) are constructed on the periphery of the excavation along the shoreline (maximum perimeter of approximately 58,856 feet) as part of pilot project implementation, then 135 acres of suitable wood stork foraging habitat could be created depending on operational guidelines developed for the project. Additional habitat could be created by implementing further wildlife enhancements. Since littoral shelves are not currently part of the project, this potential benefit will not be tallied for this report. The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning.

Everglade snail kite

No designated critical habitat for the snail kite is found within any of the North Lake Belt Area Project footprint currently being investigated. Plant communities classified as disturbed prairie, prairie with 10 to 50 percent melaleuca cover, and disturbed prairie with 10 to 50 percent melaleuca cover and exhibiting a long hydroperiod represent the best available snail kite habitat within the project footprint. These cover types total an estimated 114 acres, so by applying the 9 percent reduction in habitat value, these represent 104 acres that may be effected by CERP. The footprint that would be required to construct the maximum size project reservoir could have negative effects on this potential snail kite habitat. If 100-foot wide littoral shelves similar to those currently required as part of mitigation for Lake Belt mining are constructed on the periphery of the excavation along the shoreline (maximum perimeter of approximately 58,856 feet) as part of pilot project implementation, a 6-foot strip of suitable snail kite foraging habitat resulting in a total of 8 acres could be created depending on operational guidelines developed for the project. Additional habitat could be created by implementing further wildlife enhancements. Since littoral shelves are not currently part of the project, this potential benefit will not be tallied for this report.

Eastern indigo snake

All the potential North Lake Belt Area Project footprint can be considered suitable eastern indigo snake habitat except for an estimated 460 acres developed and 402 acres of existing lake and quarry. Construction of the worst-case scenario would effect an estimated 4,888 acres of all other existing land use and classifications (Table 25-1) that are suitable as habitat for eastern indigo snakes. By applying the 9 percent reduction in habitat value, these represent 4,448 acres that may be effected by CERP. The deeper open- water habitat created as part of the potential project is not suitable indigo snake habitat. Additional habitat could be created by implementing further wildlife enhancements. Presumably an estimated 440 acres of the bank areas surrounding the reservoir project perimeter would be restored to grassland, shrub, and forested habitat that would eventually be acceptable habitat for eastern indigo snakes. Indigo snakes may be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Bald eagle

No recent bald eagle nesting activity has been recorded in the North Lake Belt Area Project footprint. The habitat types associated with this project detailed in Table 25-1 are not considered suitable habitat for bald eagles. Creation of the proposed project reservoir would not result in positive habitat changes for bald eagles because the vertical sides and deep depths of the reservoir would not create significant habitat for fish. If 100-foot wide littoral shelves similar to those currently required as part of mitigation for Lake Belt mining are constructed on the periphery of the excavation as part of project implementation, then 135 acres of potential foraging habitat could be created depending on operational guidelines developed for the project and on the availability of suitable perch and nest sites. Additional habitat could be created by implementing further wildlife enhancements. Since littoral shelves are not currently part of the project, this potential benefit will not be tallied for this report. New electrical lines would be needed associated with the installation of pumps near open water and could pose an electrocution hazard for eagles. The publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

West Indian manatee

The footprint of construction of the North Lake Belt Area Project as discussed would have no impact on the West Indian manatee except possibly at the location of any new pumps, intakes, and outfall structures constructed for the project on the C-6, C-9, C-7, C-4, or C-2 Canals. Although there are no data indicating manatees being injured or killed on the canals directly associated with this project, they have been documented in canals as far upstream as the potential project footprint. Mortality or disturbance could result from construction and operation of new pumps, intakes, and outfall structures. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during project construction to

ensure minimal or no disturbance to manatees during construction. A multi-agency team is developing additional guidance for structure design and manatee access.

Coordination with the Corps and the District for the North Lake Belt Storage Area project

This project is not currently authorized and no Corps lead has been designated. A PDT does not exist for this project and the project is considered inactive. The project is scheduled to begin in March 2013.

Section 7 consultation

There is no history of consultation on this inactive project.

26 Central Lake Belt Storage Area

Central Lake Belt Storage Area project description

This project would include pumps, water control structures, an STA, and a combination above-ground and in-ground storage reservoir with a total storage capacity of approximately 190,000 acre-feet located in Miami-Dade County. The initial design of the reservoir assumed 5,200 acres with water levels fluctuating from 16 feet above grade to 20 feet below grade. A subterranean seepage barrier would be constructed around the perimeter to enable draw down during dry periods and to prevent seepage losses. A pilot test of this technology would be conducted prior to final design of this component to determine construction technologies, storage efficiencies, impacts upon local hydrology, and water quality effects. Since this facility is to be located within the protection area of Miami-Dade County's Northwest Well field, the pilot test would also be designed to identify and address potential impacts to the County's well field that may occur during construction and operation. The STA was assumed to be 640 acres with the water level fluctuating up to 4 feet above grade. The final size, depth, and configuration of these facilities would be determined through more detailed planning and design. A description of pumps, water control structures, canals, and other structures that are also part of the project is not possible at this stage of the planning. The potential acres that would be occupied by these structures would be small and can for all practical purposes be assumed to be covered at this stage in the planning process in the total project acres estimated at 5,840 acres.

The purpose of the project is to store excess water from WCAs 2 and 3 and provide environmental water supply deliveries to: (1) Northeast Shark River Slough, (2) WCA 3B, and (3) to Biscayne Bay, in that order, if available. Due to the source of the water (WCAs 2 and 3), it is assumed that water stored in this facility is of adequate quality to return to the Everglades Protection Area and Biscayne Bay; however, the final size, depth and configuration of these facilities, including treatment requirements, would be determined through more detailed planning and design.

Excess water from WCAs 2 and 3 would be diverted into the L-37, L-33, and L-30 borrow canals, which run along the eastern boundaries of the WCAs, and pumped into the Central Lake Belt Storage Area. Water supply deliveries would be pumped through an STA prior to discharge to the Everglades via the L-30 borrow canal and a reconfigured L-31N borrow canal. If available, deliveries would be directed to Biscayne Bay through the Snapper Creek Canal at Florida's Turnpike. A structure would be provided on the Snapper Creek Canal to provide regional system deliveries when water from the Central Lake Belt Storage Area is not available. Figures 26-1 and 26-2 illustrate the project location and boundary.

A pilot test would be conducted prior to final design to determine construction technologies, storage efficiencies, impacts upon local hydrology, and water quality effects. The water quality assessment would include a determination as to whether the in-ground reservoir with perimeter seepage barrier would allow storage of untreated runoff.

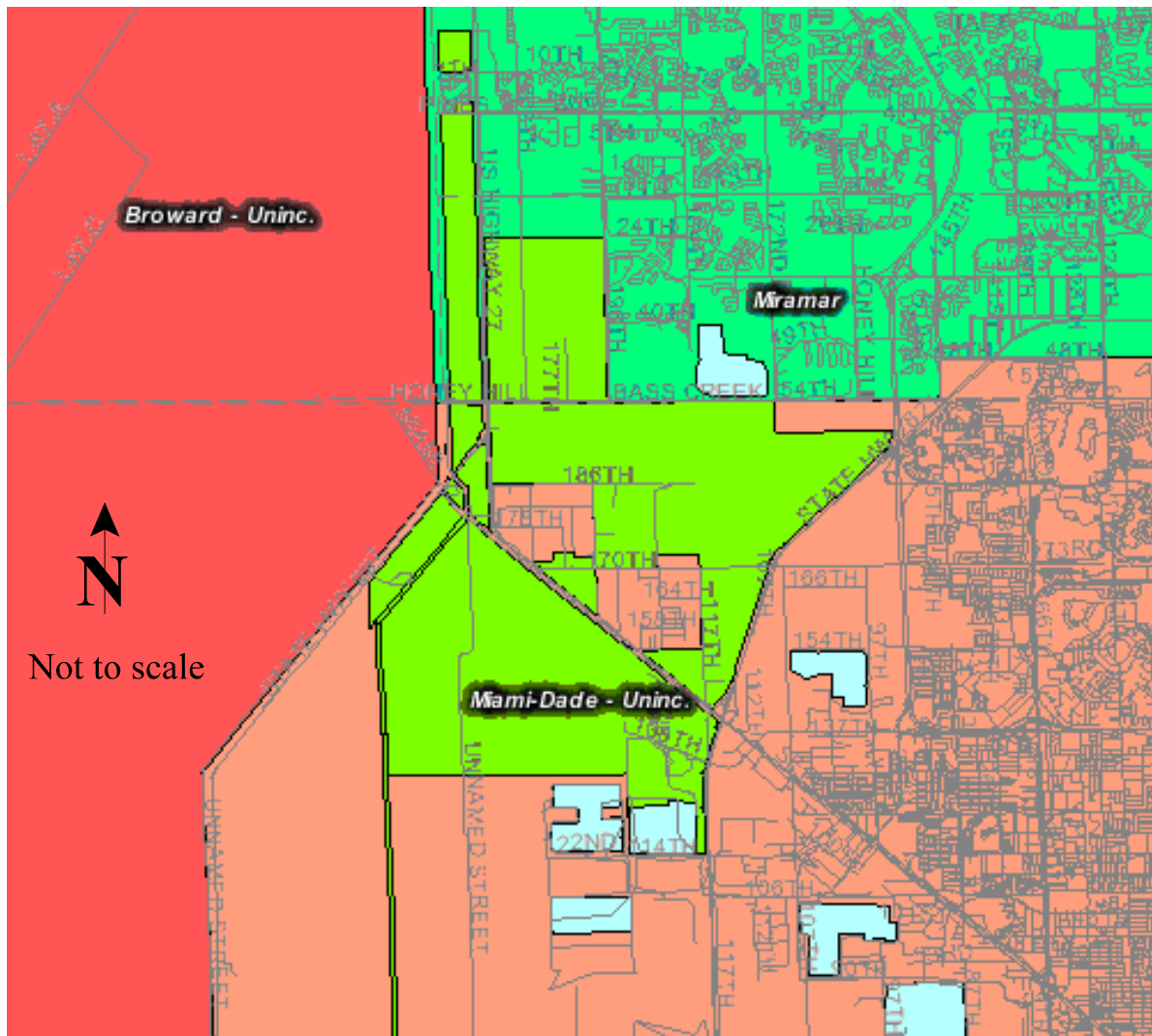


Figure 26-1. Central Lake Belt Storage Area project location
 (<<http://www.evergladesplan.org> >; District 2003).

The estimated current land use or vegetative classification in the potential total project acres of 5,840 acres is listed in Table 26-1.



Figure 26-2. Central Lake Belt Storage Area Project boundary. The project includes pumps, water control structures, an STA, and a combination above-ground and in-ground storage reservoir with a total storage capacity of approximately 190,000 acre-feet located in Miami-Dade County (http://www.evergladesplan.org/pm/projects/cefp_gis.cfm).

Table 26-1. Land Use and Classification, Acres, and Percent of Total - Central Lake Belt Area Project.

Land Use/Classification	Percent of Total Project Acres	Number of Acres
Developed	2	116
Agriculture	7	410
Lake/Quarry	24	1,402
Disturbed Prairie	6	350
Prairie with Melaleuca 10-50%	9	525
Disturbed Prairie w/Melaleuca 10-50%	9	525
Prairie with Melaleuca 50-75%	13	759
Dense Melaleuca Saplings 75-100%	3	175
Dense Melaleuca Forest 75-100%	27	1,578
Total	100	5840

Project Footprint

The project footprint is expected to cover the entire acres detailed above with either impoundment, levee, canal, or pump and piping facilities. Acres currently detailed within the lake and quarry classification would likely not change its land use and classification. The current schedule for the project is to begin construction for the project in 2013 with construction completed in 2036. Currently 1,402 of a total of 5,840 acres have been mined. Additionally, approximately 330 acres of land on average is being mined each year within all the Lake Belt mining sites at the current rate; however, the rate and location of mining is dependent on demand, which will vary considerably. The Central Lake Belt Storage Project area represents approximately 20 percent of the total acres approved for mining in the Lake Belt region. This rate would represent approximately 66 acres per year of further mining in the Central Lake Belt area or approximately 660 acres of additional mining before project construction commences in 2013. The pre-project impacts can thus be estimated as a combination of currently mined area (1,402 acres) plus approximately 660 additional acres projected to be mined before 2013. Therefore, the pre-project acres to be mined represents 15 percent of the total.

Initial effects analysis for the Central Lake Belt Storage Area project

At this point in the planning process, it is difficult to provide detailed comments on threatened or endangered species issues or on other wildlife and environmental issues. Our comments are therefore more general in nature at this point, and would be developed in greater detail as the process is completed in the form of additional PALs and a FWCA Report, as well as the required consultation under the ESA. Additional planning is essential once the final project plan and sites are selected. For purposes of determining effected habitat acres it would be assumed that estimated additional mining impacts projected to occur before effects attributable to the CERP project commence detailed above would be distributed equally across all habitat types. Therefore a factor of 15 percent will be subtracted from all habitat calculations.

Wood stork

None of the footprint acres for the Central Lake Belt Area Project is within the Primary or Secondary Zones of known wood stork colonies. All of the footprint acres for the Central Lake Belt Area Project is within the 18.6-mile CFA of documented wood stork nesting colonies outside the project area, with various degrees of value as wood stork foraging habitat. The Dade County Lake Belt Plan: Wildlife Study (Dalrymple and Dalrymple, 1996) recorded one observation of wood stork use over a 24-month period in 50 to 75 percent melaleuca cover type and recorded no observations in the 75 to 100 percent melaleuca cover type. Plant communities classified as disturbed prairie, prairie with 10 to 50 percent melaleuca cover, and disturbed prairie with 10 to 50 percent melaleuca cover, and exhibiting a long hydroperiod represent the best available wood stork habitat within the project footprint. These cover types total an estimated 1,400 acres, so by applying the 15 percent reduction in habitat value, these represent 1,190 acres that may be effected by CERP. The footprint that would be required to construct the maximum size project reservoir could have negative effects on this potential wood stork habitat.

If 100-foot wide littoral shelves (similar to those currently required as part of mitigation for Lake Belt mining) are constructed on the periphery of the excavation along the shoreline (maximum perimeter of approximately 59,904 feet), then an estimated 187 acres of potential wood stork foraging habitat could be created depending on operational guidelines developed for the project. Additional habitat could be created by implementing further wildlife enhancements. Since littoral shelves are not currently part of this project, this potential benefit will not be tallied for this report. The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning.

Everglade snail kite

No designated critical habitat for the snail kite is found within any of the Central Lake Belt Area Project footprint currently being investigated. Plant communities classified as disturbed prairie, prairie with 10 to 50 percent melaleuca cover, and disturbed prairie with 10 to 50 percent melaleuca cover represents the best available snail kite habitat within the project footprint. These cover types total an estimated 1,400 acres, so by applying the 15 percent reduction in habitat value, these represent 1,190 acres that may be effected by CERP. The footprint that would be required to construct the maximum-size project reservoir could have negative effects on this potential snail kite habitat. If 100-foot wide littoral shelves (similar to those currently required as part of mitigation for Lake Belt mining) are constructed on the periphery of the excavation along the shoreline (maximum perimeter of approximately 59,904 feet) as part of pilot project implementation, a 6-foot strip of suitable snail kite foraging habitat resulting in a total of 8 acres could be created depending on operational guidelines developed for the project. Additional habitat could be created by implementing further wildlife enhancements. Since littoral shelves are not currently part of this project, this potential benefit will not be tallied for this report.

Eastern indigo snake

All the potential Central Lake Belt Area Project footprint can be considered suitable eastern indigo snake habitat except for an estimated 116 acres of developed and 1,395 acres of existing lake and quarry. Construction of the worst case scenario would impact an estimated 4,329 acres of all other existing land use and classifications (Table 26-1) that are suitable as habitat for eastern indigo snakes, so applying the 15- percent reduction in habitat value, these represent 3,680 acres that may be effected by CERP. The deeper open-water habitat created as part of the potential project is not suitable eastern indigo snake habitat. Additional habitat could be created by implementing further wildlife enhancements. Presumably an estimated 374 acres of the bank areas surrounding the reservoir project perimeter would be restored to grassland, shrub, and forested habitat that would eventually be acceptable habitat for eastern indigo snakes. Indigo snakes may be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Bald eagle

No recent bald eagle nesting activity has been recorded in the Central Lake Belt Area Project footprint. The habitat types associated with this project detailed in Table 26-1 are not considered suitable habitat for bald eagles. Creation of the proposed project reservoir would not result in positive habitat changes for bald eagles because the vertical sides and deep depths of the reservoir would not create significant habitat for fish. If 100-foot wide littoral shelves (similar to those currently required as part of mitigation for Lake Belt mining) are constructed on the periphery of the excavation as part of project implementation, 138 acres of potential foraging habitat could be created depending on operational guidelines developed for the project and on the availability of suitable perch and nest sites. Additional habitat could be created by implementing further wildlife enhancements. Since littoral shelves are not currently part of this project, this potential benefit will not be tallied for this report. New electrical lines would be needed associated with the installation of pumps near open water and may pose an electrocution hazard for eagles. The publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

West Indian manatee

The footprint of construction of the Central Lake Belt Area Project as discussed would have no impact on the West Indian manatee except possibly at the location of new pumps, intakes, and outfall structures constructed for the project on the L30, L33, L37 or L31N canals. Although there are no data indicating manatees being injured or killed in the canals directly associated with this project, they have been documented in canals as far upstream as the potential project footprint. Mortality or disturbance could result from construction and operation of new pumps, intake, outfall structures. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during project construction to ensure minimal or no disturbance to manatees during construction. A multi-agency team is developing additional guidance for structure design and manatee access.

Coordination with the Corps and the District for Central Lake Belt Storage Area project

This project is considered inactive. The project is scheduled to begin in March 2013.

Section 7 consultation documents

There is no history of consultation on this inactive project.

Everglades National Park Seepage Management project description

This project includes relocating and enhancing L-31N, installing groundwater wells, and providing a sheetflow delivery system adjacent to ENP in Miami-Dade County. More detailed planning, design, and pilot studies will be conducted to determine the appropriate technology to control seepage from ENP. These studies and tests will also determine the appropriate amount of wet-season groundwater flow control that will minimize potential effects to Miami-Dade County's West Well field and freshwater flows to Biscayne Bay. Figure 27-1 illustrates the location and features of the project. The purpose of this project is to improve water deliveries to Northeast Shark River Slough and restore wetland hydropatterns in ENP by reducing levee and groundwater seepage and increasing sheetflow.

This project would reduce levee seepage flow across L-31N adjacent to ENP via a levee cutoff wall or other technology tested as effective during the L-31N Seepage Management Pilot Project. Groundwater flows during the wet season may be captured by groundwater wells adjacent to L-31N and pumped back to ENP. Water from upstream natural areas would be diverted into a buffer area adjacent to ENP where sheetflow would be reestablished. Further, this project includes relocation of structure S-357, relocation of S-356, and construction of S-356B to provide more effective water deliveries into ENP and optimize other water deliveries. New discharges to ENP would be designed to meet applicable water quality criteria.

Project Footprint

The diversity of the potential technologies yet to be evaluated makes it difficult to assess potential effects on threatened or endangered species. No decision has been made at this time on the final location of the seepage management project or the size of its footprint. For purposes of this analysis, the project footprint will be considered in a worst-case scenario that will include: (1) relocation of an estimated 8.5-mile length, 300-feet wide, of L-31N approximately 1 mile from its present location to east of Krome Avenue; (2) construction of levee seepage management along the eastern edge of the relocated L-31N to eliminate losses due to levee seepage to the east coast; (3) removal of the present L-31N canal and levee from S-356 to C-1W (approximately 7.5-mile length, 300-feet wide); (4) construction of groundwater wells and pumps adjacent to L-31N to backpump water into ENP; and (5) construction of S-356B and relocation of S-356 and S-357. For purposes of this effect analysis it is assumed that installation of seepage management technology, and construction of S-356B and relocation of S-356 and S-357 would be accomplished concurrently with relocation of the L-31N segment and would cause no additional footprint effects beyond the relocation construction activity.

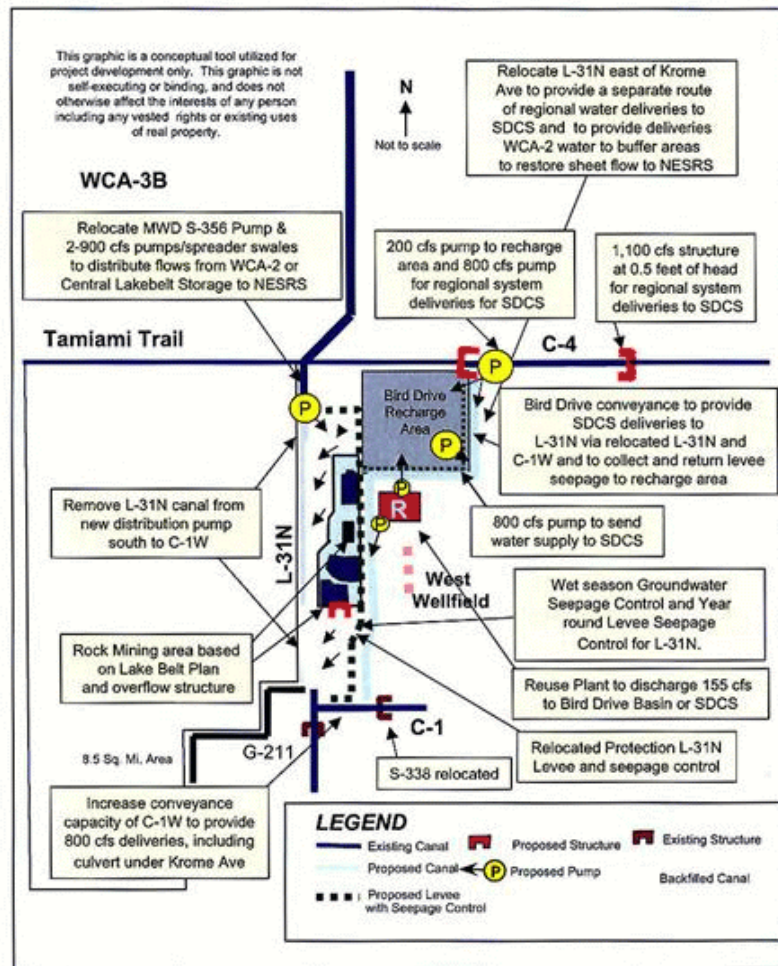


Figure 27-1. Everglades National Park Seepage Management Project location and features (Not to scale). The purpose of this project is to improve water deliveries to Northeast Shark River Slough and restore wetland hydropatterns in ENP by reducing levee and groundwater seepage and increasing sheetflow (Component Map 7, Appendix A4; Corps 1999).

Initial effects analysis for the Everglades National Park Seepage Management project

At this point in the planning process, it is difficult to provide detailed comments on threatened or endangered species issues or on other wildlife and environmental issues. Our comments are therefore more general in nature at this point, and will be developed in greater detail as the process is completed in the form of additional FWCA PALs and a FWCA Report, as well as the required consultation under the ESA. Additional planning is essential once the project technology and site are selected.

Wood stork

None of the footprint acres for the ENP Seepage Management Project is within the Primary or Secondary Zones for known wood stork colonies. All of the footprint acres for the project is within the 18.6-mile CFA of documented wood stork nesting colonies outside the project area and includes potential foraging habitat for wood storks in the form of shallow marsh and prairie habitat when the proper water conditions exist. Relocation of the L-31N canal (with associated well and pump sites) to east of Krome Avenue would cause an estimated 310 acres of potential effect on potential wood stork foraging habitat. Suspended sediment created by construction from either removal of the existing levee or relocation of L-31N and which is allowed to run off the levee could effect availability of prey species for wood storks. However it is assumed that sediment barriers will be properly used during construction, and no effect on availability of stork prey items will be caused by siltation. The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning.

Removal of the L-31N segment detailed above would have an estimated positive gain in foraging habitat for wood storks. Assuming complete leveling and backfilling of all structures to a level similar to surrounding habitat conditions, a return to a more natural sheet flow hydrologic regime and recovery of native marsh vegetation would result in a net benefit of all 275 acres to wood storks.

Everglade snail kite

No designated critical habitat for the snail kite is found within any of the ENP Seepage Management Project footprint. The footprint of the ENP Seepage Management Project includes marginal foraging habitat for snail kites in the form of shallow marsh and prairie habitat when the proper water conditions exist. Suspended sediment created by construction from either removal of the existing levee or relocation of L-31N and which is allowed to run off the levee could effect visibility of apple snails, the principal prey species for snail kites. However it is assumed that sediment barriers will be properly used during construction, and snail kites will be able to see their prey items. Relocation of the L-31N canal (with associated well and pump sites) to east of Krome Avenue would have minimal effect on snail kites due to the short hydroperiod nature of these wetlands.

Removal of the L-31N segment detailed above would have an estimated positive gain in foraging habitat for snail kites. Assuming complete leveling and backfilling of all structures to a level similar to surrounding habitat conditions, a return to a more natural sheet flow hydrologic regime, and recovery of native marsh vegetation, would result in a net benefit of all 275 acres to snail kites.

Eastern indigo snake

The entire potential ENP Seepage Management Project footprint can be considered suitable eastern indigo snake habitat. Construction of the worst-case scenario project would convert approximately 103 acres of short hydroperiod shallow marsh and prairie habitat to canal which is not indigo snake habitat, and would create approximately 172 acres of levee habitat at the proposed relocated L-31N site. Conversely, removal of the L-31N segment detailed above would convert the approximately 91 acres of canal and approximately 172 acres of levees to shallow marsh and prairie considered suitable for indigo snakes, assuming complete leveling and backfilling of all structures to a level similar to surrounding habitat conditions, a return to a more natural sheet flow hydrologic regime, and recovery of native marsh vegetation. Since the 172 acres of existing levee will be suitable habitat both before and after the project, no net gain or loss will be tallied for this feature. Indigo snakes may be directly harmed or harassed during construction activities and road mortality could occur if the existing levee is used for equipment access to the construction area during L-31N removal or if a new access road is needed for relocation and construction of the new levee and canal. The Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Florida panther

The existing L-31N levee is the boundary and just within the designated Primary/Dispersal Zone for panther habitat. The habitat type associated with this project (levee bank with grass, forbs, small shrubs, and wetland plant species) is occasionally used by Florida panthers. Removal of the levee and backfilling the canal to a level similar to surrounding habitat conditions would result in a net gain of 91 acres (24 acres of freshwater marsh and 67 acres of wet prairie) of high value panther habitat (FLUCCS Codes 641 and 643) from the converted deepwater canal.

Bald eagle

No recent bald eagle nesting activity has been recorded in the ENP Seepage Management Project area. Canals could be utilized as foraging habitat depending on the availability of suitable roost trees; therefore, the project could have a maximum potential positive effect of an estimated 103 acres of foraging habitat gained from the canal created by relocation of the L-31N canal, and 91 acres lost from backfilling of the present canal location. New electrical lines would be needed associated with the installation of pumps near open water and water control structures. The publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

West Indian manatee

West Indian manatee mortality data have documented manatees from 1978 and 2001 in the Tamiami Canal (C-4) and several other canals that are connected to the L-31N canal in the Miami and Homestead area. Almost all documented occurrences have been in the lower canal reaches closer to Biscayne Bay and Card and Barnes Sounds. It is difficult for manatees to move

up most canal systems beyond pump stations and spillways. The potential does at least exist for manatees to move into the L-31N canal system either in its present or proposed relocated configuration. Mortality or disturbance could result from construction and operation of new pumps and water control structures and during filling and relocation of canals. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during project construction to ensure minimal or no disturbance to manatees during construction. Installation and operation of manatee exclusion devices at water control structures should minimize the possibility of take during pump operation. A multi-agency team is developing additional guidance for structure design and manatee access.

Coordination with Corps and the District for the Everglades National Park Seepage Management project

This project is currently authorized under the Water Resources Development Act (2000). No Corps project lead has been designated. A PDT not exist for this project and the project is considered inactive. The project is scheduled to begin in June 2006.

Section 7 consultation documents

There is no history of consultation on this inactive project.

Biscayne Bay Coastal Wetlands project description

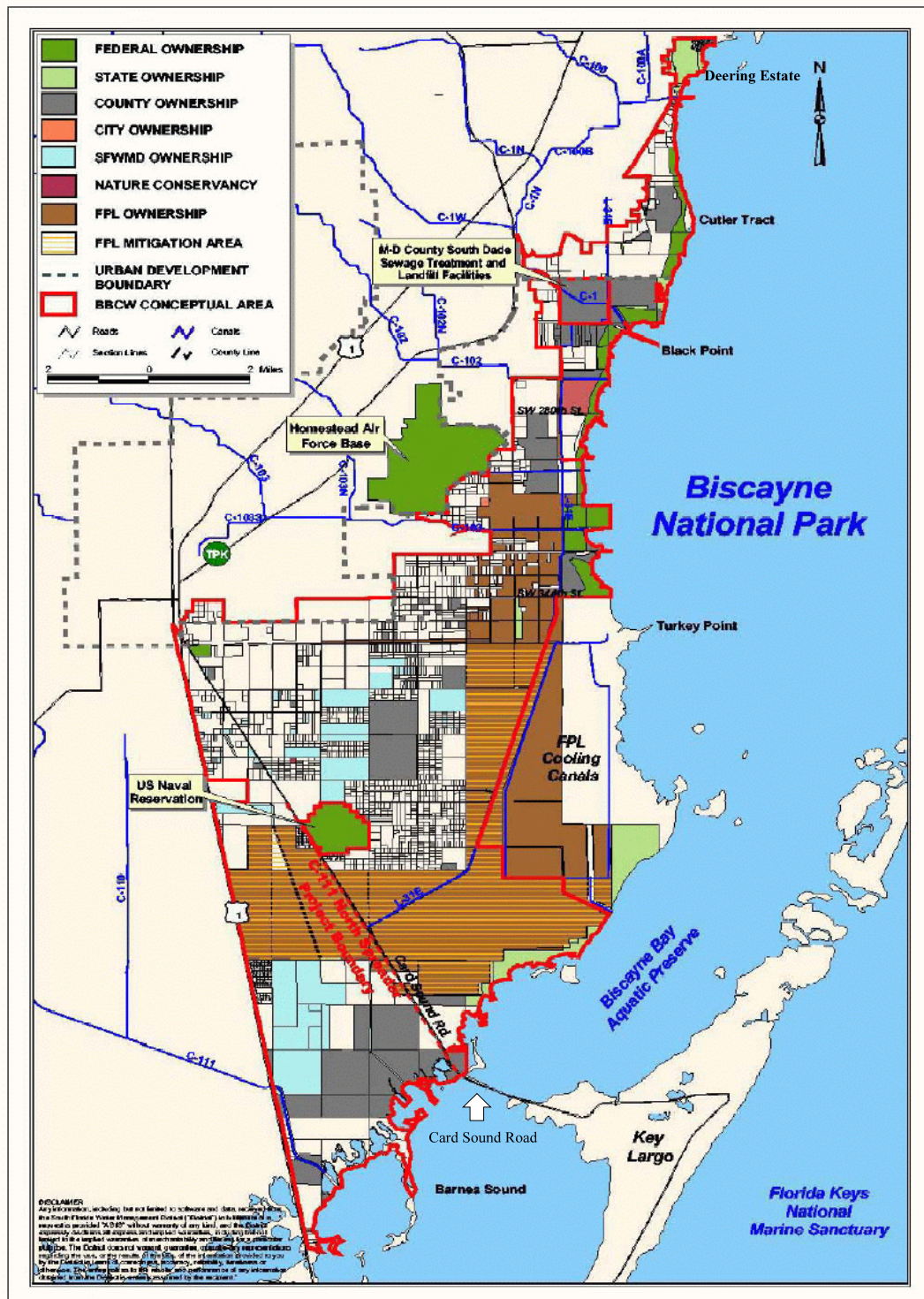
As described in the Biscayne Bay Coastal Wetlands PMP (Corps 2002e), the primary purpose of the Biscayne Bay Coastal Wetlands project is to redistribute freshwater runoff from the watershed into Biscayne Bay, away from the canal discharges that exist today, and provide a more natural and historic overland flow through existing and improved coastal wetlands. The project consists of two major components: a land-intensive system that retains water, improves wetland hydroperiods, and directs water through alternative routes more like the original drainage system; and an operational change to increase water elevations at the coastal water control structures in the dry season. The general geographic extent of the project includes the mainland coast of southern Biscayne Bay from the Deering Estate at C-100C, south into the undeveloped areas south of Homestead and Florida City known as the Model Lands basin (Fig. 28-1). For purposes of this document the southwestern project boundary is considered to be Card Sound Road from Florida City to the edge of the mainland, as defined by District GIS project boundary maps. These maps indicate that the project encompasses approximately 46,000 acres.

The proposed project will replace lost overland flow and partially compensate for the reduction in groundwater seepage by redistributing available surface water entering the area from regional canals through a spreader system. The proposed redistribution of freshwater flow across a broad front is expected to restore or enhance freshwater wetlands, tidal wetlands, and nearshore bay habitat. Sustained lower-than-seawater salinities are required in tidal wetlands and the nearshore bay to provide nursery habitat for fish and shellfish. The project is expected to create conditions that will be conducive to the re-establishment of oysters, shrimp and other components of the oyster reef community. Diversion of canal discharges into coastal wetlands is expected to both re-establish productive nursery habitat along the shoreline and reduce the abrupt freshwater discharges that are physiologically stressful to fish and benthic invertebrates near canal outlets.

The Biscayne Bay Coastal Wetlands project has been subdivided into five sub-components, which are described below. Project features include pump stations, spreader swales, STAs, flowways, levees, culverts, and backfilling canals located in southeast Miami-Dade County (Figs. 28- 1-7). Locations and sizes of the project features described in the sub-components are preliminary estimates that will be updated as modeling and preliminary design are performed during the PIR phase of the project, which is just underway. A concerted effort will be made to recommend non-structural alternatives where possible.

Sub-component 1 - Deering Estate Flowway

Operation of this sub-component involves pumping water from the SW 160th Street ditch (a tributary to C- 100C) through property adjacent to the Deering Estate and ultimately into Cutler Drain, which runs through the Deering Estate. The design involves adding a 50-cfs pump station at the end of SW 160th Street Canal, filling in mosquito ditches in coastal mangroves, and constructing weirs to delay water passage in old Cutler Drain (Fig. 28-3).



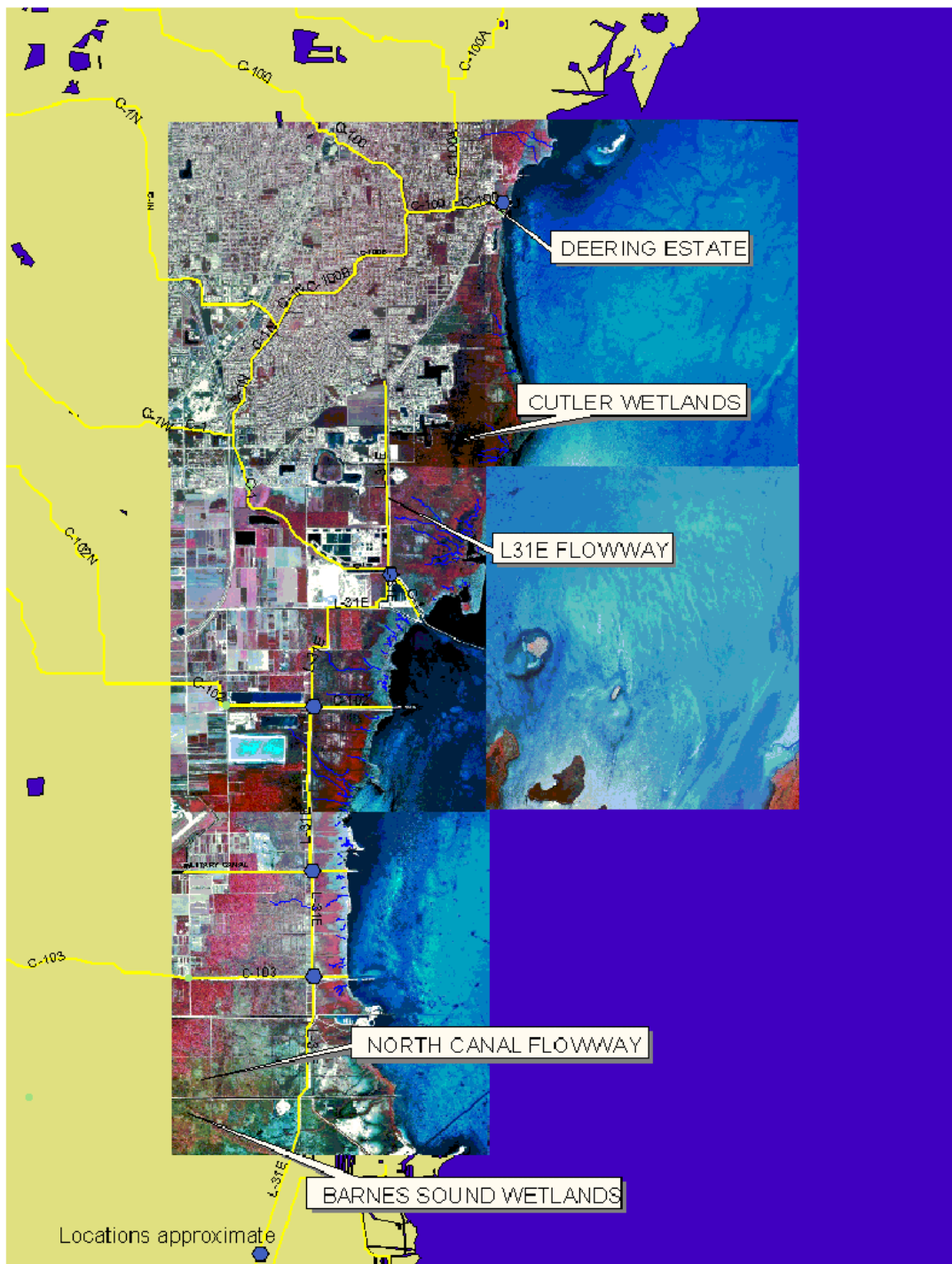


Figure 28-2. Conceptual project components for the Biscayne Bay Coastal Wetlands project - from Restudy (Figure 3; Corps 2002e). Locations are approximate. Yellow - existing canals; Red - proposed structures.

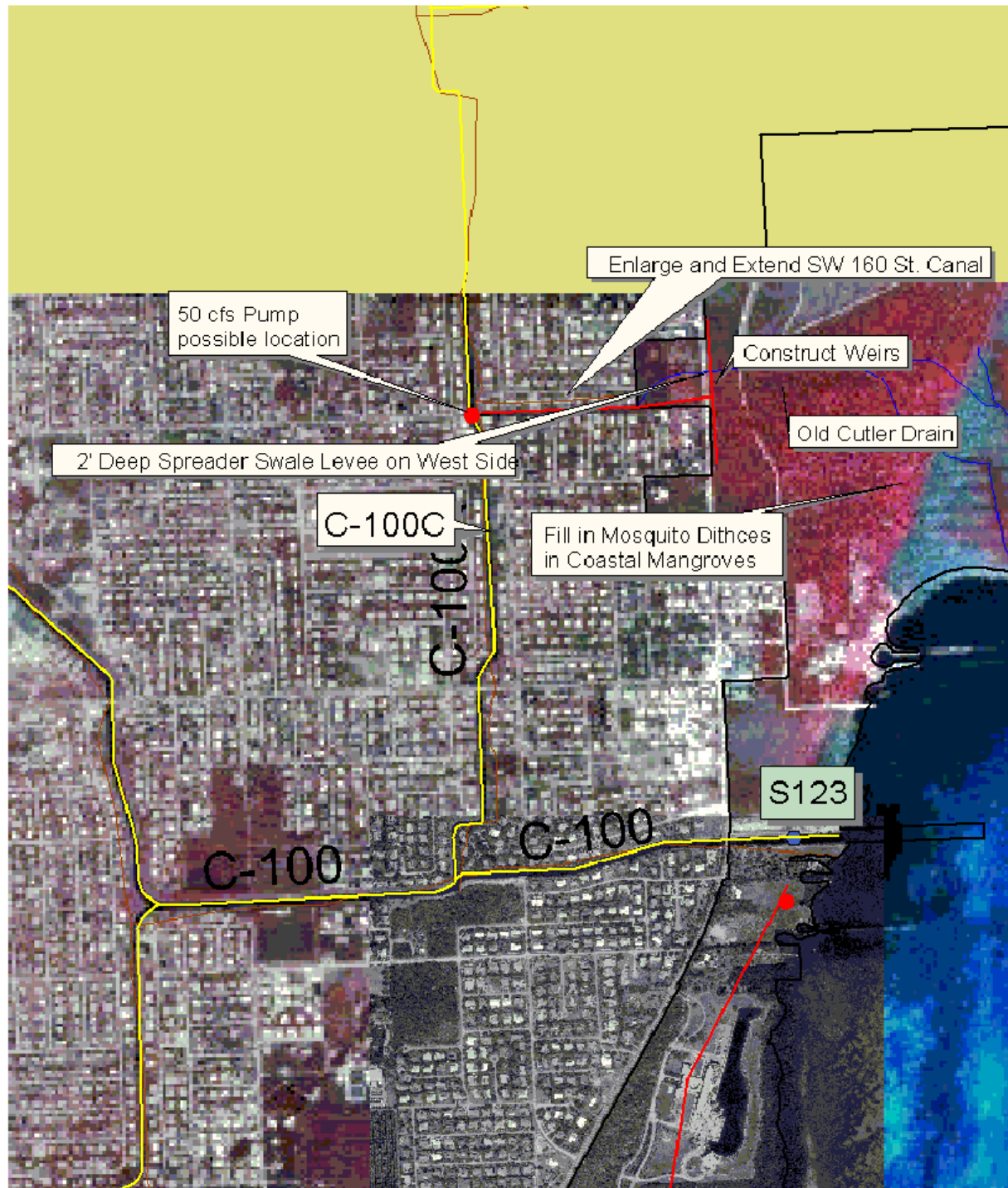


Figure 28-3. Deering Estates component for the Biscayne Bay Coastal Wetlands project (Figure 3a; Corps 2002e). Locations are approximate. Yellow - existing canals; Red - proposed structures.

Sub-component 2 - Cutler Wetlands

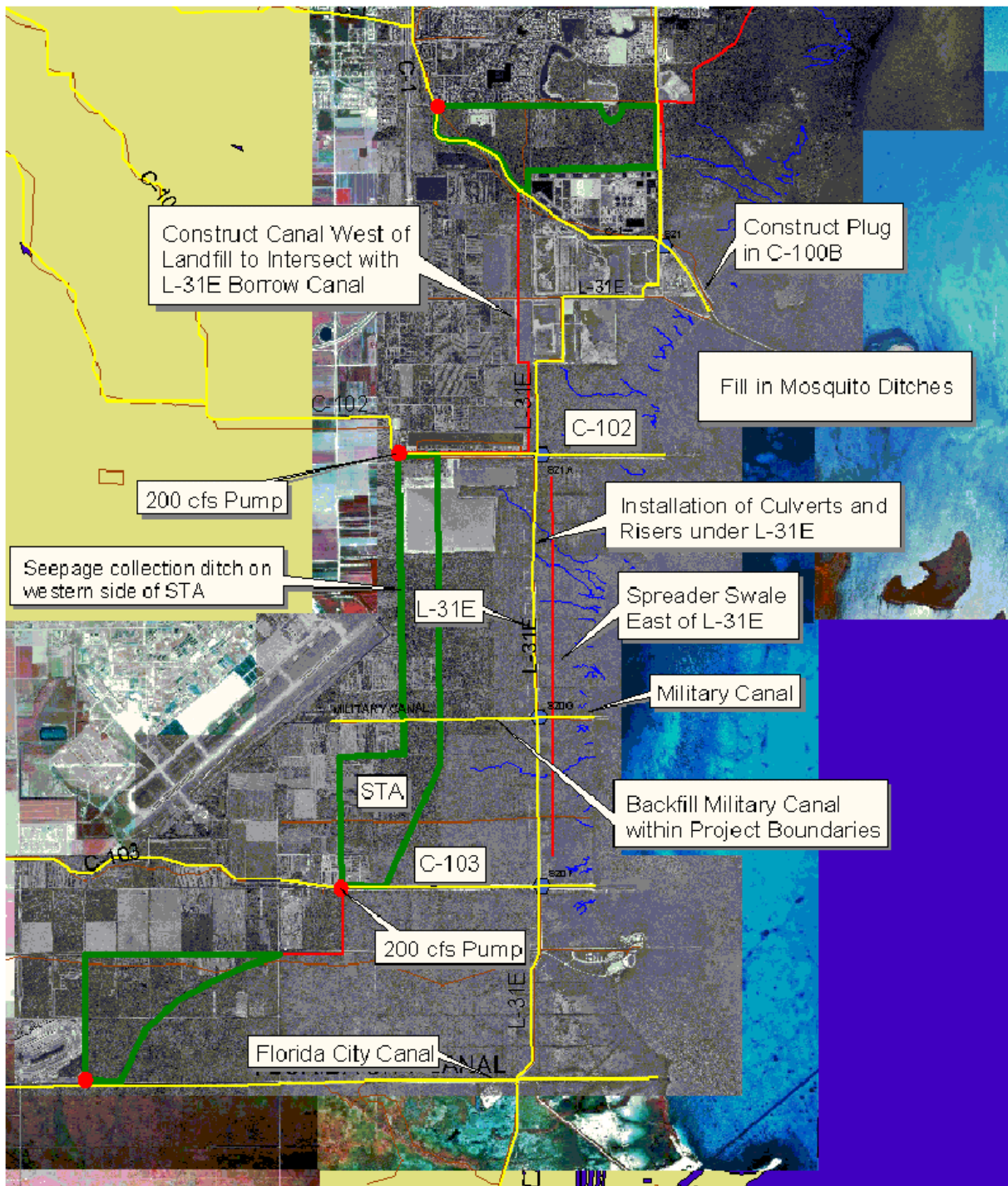
Operation of this sub-component involves: (1) routing water south from C-100A to the Cutler Wetlands Proposal Area via a shallow distribution swale on the surface of the marl to C-100B; (2) pumping water from C-100B to a spreader swale; and (3) pumping water from C-100A south into a spreader swale to allow sheetflow to Biscayne Bay. Depending on water quality, flows may need to be routed through STAs. Design involves constructing: (1) a spreader swale from C-100A south to C-100B; (2) a levee west of the spreader swale; and (3) a 200-cfs pump along the north end of the spreader swale at C-100A. If water quality dictates, the design may also involve construction of an STA adjacent to C-100B, a 200-cfs pump adjacent to the STA and C-100B, and a levee seepage canal along the northern and southern sides of the STA (Fig. 28-4).

Sub-component 3 - L-31E Flowway

The purposes of this sub-component are to reestablish conditions for living oyster bars along the shoreline of the Bay and to hydrologically isolate the Miami-Dade County landfill. A flow redistribution system will be created west of L-31E and existing wetlands will be restored in the area between L-31E and the western boundary of the redistribution system. A distribution swale with a western levee will be constructed along this boundary. The wetland area west of L-31E should be used for short-term, shallow ponding of water to maintain wetlands and help drive freshwater flow to the nearshore bay out of the east bank of L-31E. Depending on water quality, flows may need to be routed through an STA. Design involves: (1) installation of culverts and risers under L-31E; (2) construction of a spreader swale east of L-31E; (3) backfilling Military Canal; (4) construction of a plug in C-100B; (5) construction of a canal west of the landfill to intersect with L-31E borrow canal; and (6) filling in mosquito ditches. If water quality dictates, the design may also involve construction of: (7) an STA from C-102 to C-103 and east of Homestead Air Reserve Base; (8) a seepage collection ditch on the western side of the STA; (9) construction of a 200-cfs pump at C-102 to the STA; and (10) construction of a 200-cfs pump at C-103 to the STA (Fig. 28-5).

Sub-component 4 - North Canal Flowway

The operation of this sub-component involves pumping available water from C-103 and the Florida City Canal to re-establish sheetflow across freshwater and coastal wetlands to Biscayne Bay. Depending on water quality, flows may need to be routed through an STA. Design involves: (1) construction of a 200-cfs pump on C-103; (2) construction of a 200-cfs pump on Florida City Canal; (3) installation of culverts and risers under L-31E; (4) construction of a delivery canal from C-103 south to North Canal; (5) construction of a spreader swale east of L-31E; (6) backfilling the North Canal east of SW 112 Avenue; and (7) construction of a flowway south from the Florida City Canal from SW 127th Avenue to SW 107th Avenue. If water quality dictates, the design may also involve construction of: (8) an STA on the western edge of the coastal wetlands in between the C-103 and the Florida City Canal; (9) an STA associated with the flowway south of the Florida City Canal; and, (10) seepage management facilities around the STAs (see Fig. 28-6).



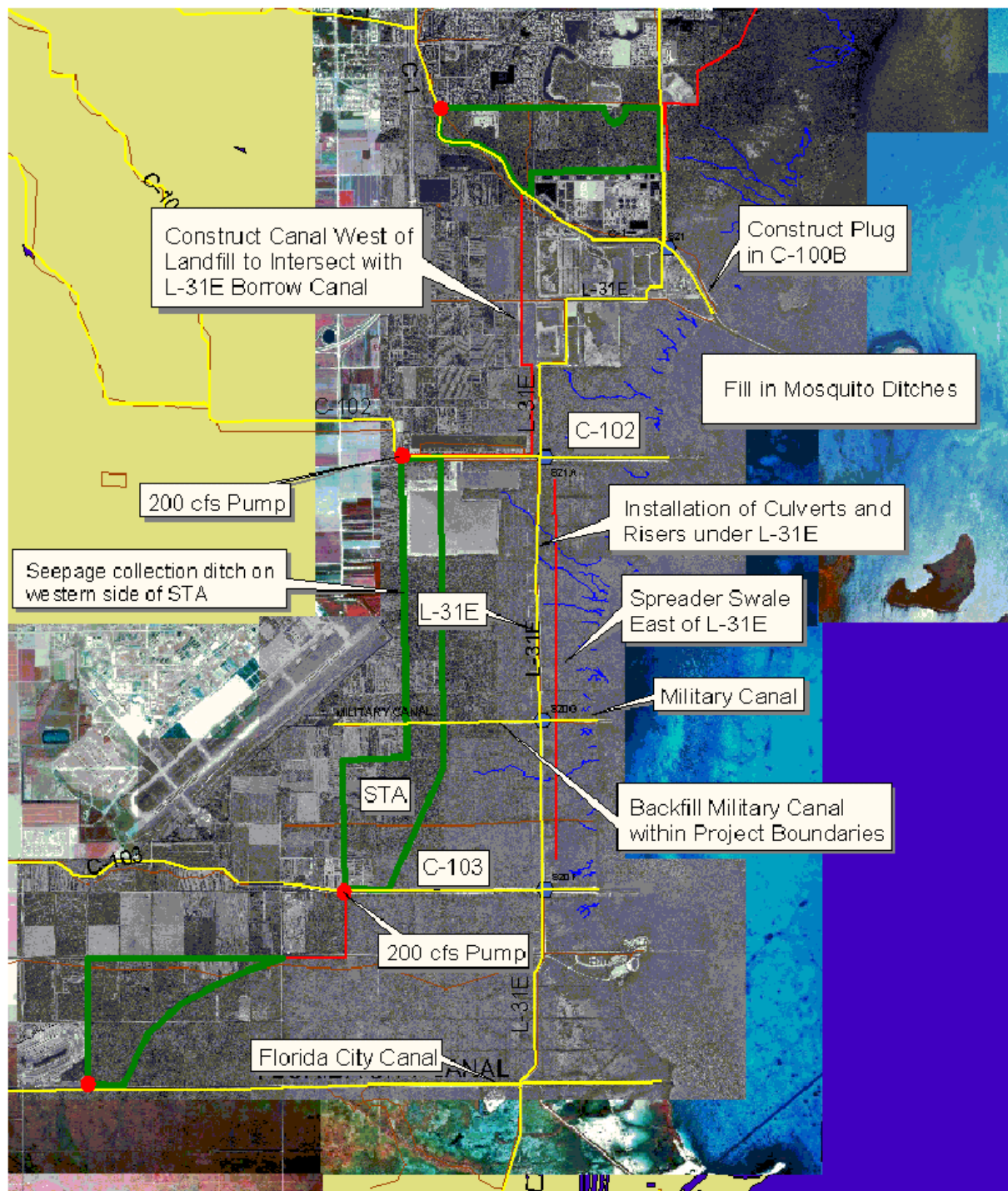


Figure 28-5. Flowway component for the Biscayne Bay Coastal Wetlands project (Figure 3c; Corps 2002e). Locations are approximate. Yellow - existing canals; Red - proposed structures.

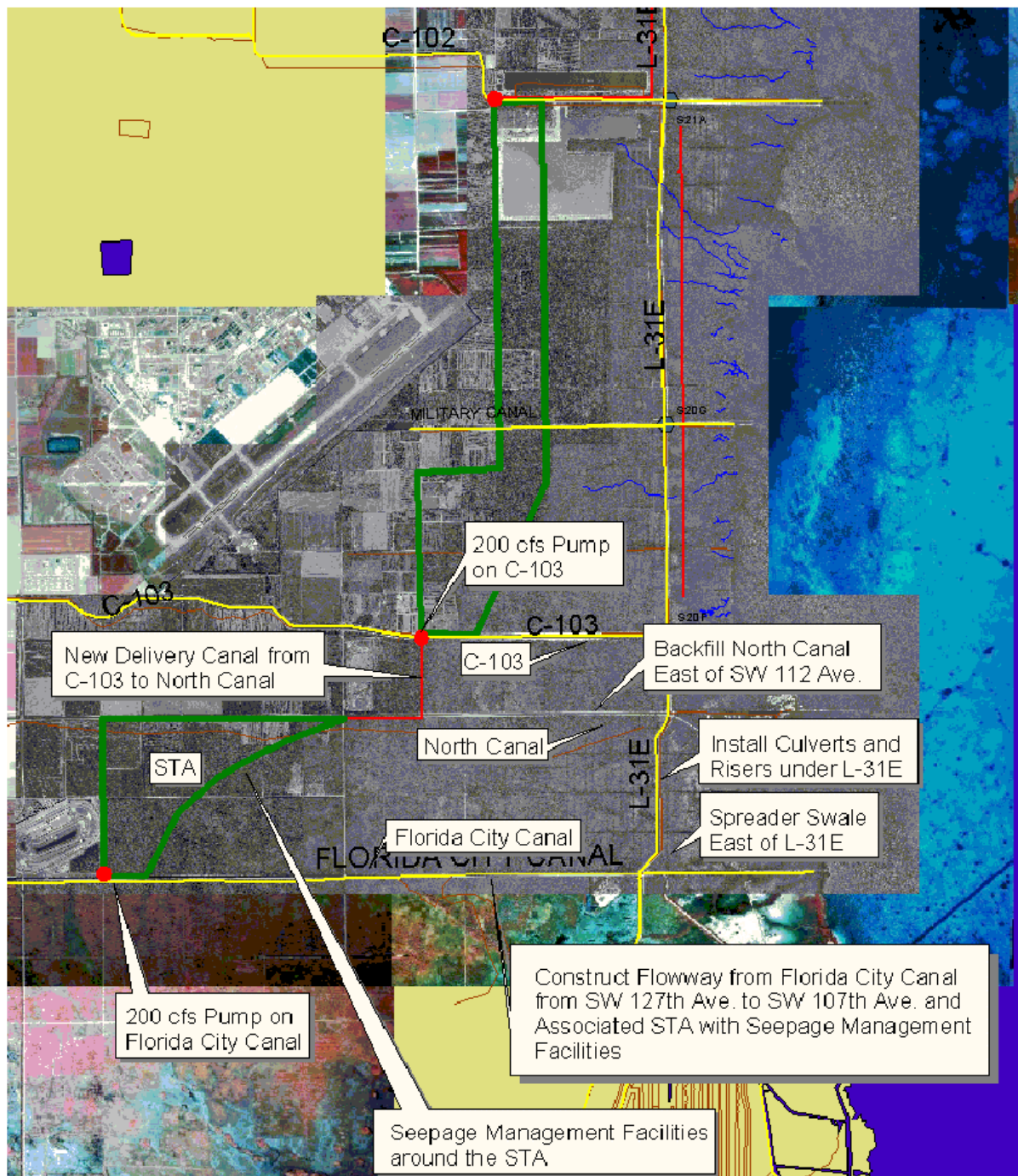


Figure 28-6. North Canal flowway component for the Biscayne Bay Coastal Wetlands project (Figure 3d; Corps 2002e). Locations are approximate. Yellow - existing canals; Red - proposed structures.

Sub-component 5 - Barnes Sound Wetlands

Operation of this sub-component involves pumping available water from the Florida City Canal to a shallow east-west spreader canal. Design involves construction of a 50-cfs pump at the Florida City Canal and a new canal south from Florida City Canal to a shallow spreader swale along the edge of the coastal wetlands. If water quality dictates, the design may also involve construction of an STA and seepage management facility (see Fig. 28-7).

An important aspect of the Barnes Sound Wetlands component is to reconnect hydrologically-isolated basins and areas in the Model Lands, including the area between US1 and Card Sound Road known as “the triangle” or “wedge.” This will involve removing unnecessary or unused roads, and installation of culverts under the Card Sound Road Canal.

Project influence spans approximately 46,000 acres along the southwestern coast of Biscayne Bay from the C-100 basin (Cutler Drain) to the C-111 basin (Aerojet Canal). Land ownership, land availability and hydrologic conditions vary within the project area, and therefore implementation approaches will vary depending on location. Some areas are hydrologically separated from others. Some areas will likely require extensive land acquisition, while others will not.

There are a number of challenges associated with restoring the hydrology and ecology of this area. These include an extensive mosquito and drainage ditch system that interferes with historic flow patterns, the presence of invasive, non-native plants and animals, potential water quality problems, and land ownership constraints. Consequently, the ditch system needs to be filled and the area would require an extensive and possibly ongoing invasive exotic plant removal program.

Biscayne Bay Coastal Canals

The purpose of CERP component FFF5, Biscayne Bay Coastal Canals, is to maintain higher stages in the C-102 and C-103 canals for urban and water supply. The scope of work described in the CERP (pg A4-47) is as follows: Maintain canal stages in C-102 and C-103 with water provided from local sources. Wet season operation for C-102 between S-21A and S-195 (open at 2.2 feet NGVD, close at 2.0 feet NGVD) and for C-103 between S-20F and S-179 (open at 2.2 feet NGVD, close at 2.0 feet NGVD) will remain unchanged. Dry season operation of C-102, between S-21A and S-195, and C-103 between S-20F and S-179, will both change from opening at 1.4 feet NGVD and closing at 1.2 feet NGVD to opening at 1.6 feet NGVD and closing at 1.5 feet NGVD. A borrow canal will be constructed west of L-31E which directly connects the downstream reach of C-102 with C-103 to maintain levels in the lower reaches of C-103. This canal is estimated to be 3.5 miles long.

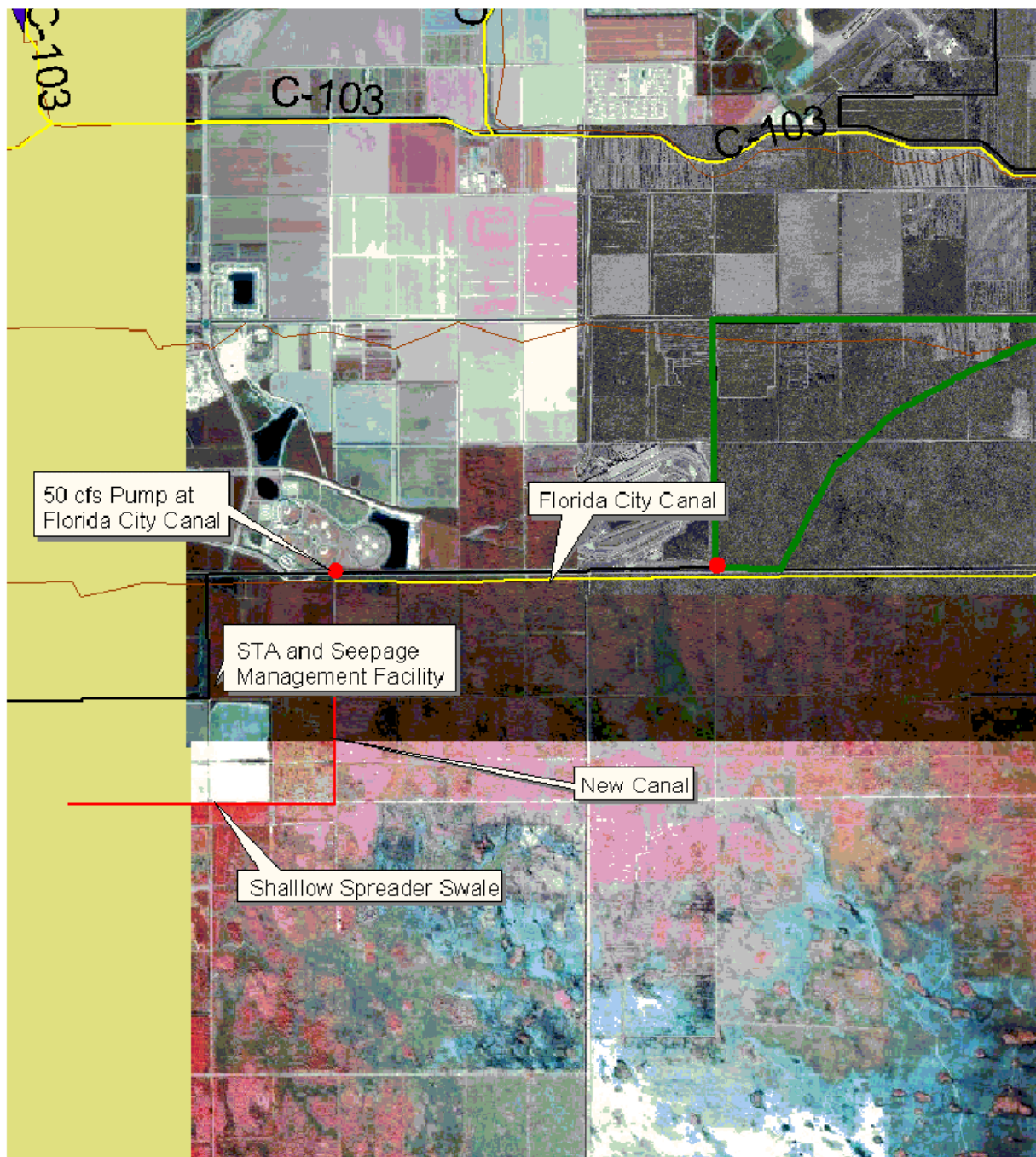


Figure 28-7. Barnes Sound wetlands component for the Biscayne Bay Coastal Wetlands project (Figure 3e; Corps 2002e). Locations are approximate. Yellow - existing canals; Red - proposed structures.

Biscayne Bay Coastal Wetlands PDT Possible Alternative Features

The above project description appears almost verbatim in both the Biscayne Bay Coastal Wetlands PMP and in Appendix 6 of the Restudy. In addition to the features described above, the Biscayne Bay Coastal Wetlands PDT has identified the following possible alternative features that should be considered.

Deering Estate Flowway

- a. Use of a spreader canal
- b. Use of historic creek beds
- c. Consider electric pump for non-flood control uses
- d. Consider gravity flow potential through Powers property instead of pumping
- e. May need a mini STA
- f. Non-native species removal

Cutler Wetlands

- a. Plug or fill mosquito ditches or could use for redistribution of flow
- b. Use of weirs/culverts rather than pumping
- c. Use of historic creek beds
- d. Consider electric pump for non-flood control uses
- e. New canal
- f. Non-native species removal

L-31E Flowway

- a. May not need to backfill Military Canal or may partially fill canal
- b. May not need new canal
- c. Use of historic creek beds
- d. Control of undesirable wetland species
- e. Non-native species removal

North Canal Flowway

- a. Use of historic creek beds
- b. Consider gravity flow rather than pumping
- c. Consider electric pump for non-flood control uses
- d. Non-native species removal

Barnes Sound Wetlands

- a. Use of historic creek beds
- b. Non-native species removal
- c. Potential use of existing flowway
- d. Use of culverts, risers and weirs instead of pumps
- e. Consider electric pump for non-flood control uses

Other restoration projects affecting the Biscayne Bay Coastal Wetlands

Other ongoing, or soon to be initiated, restoration efforts occur within the Biscayne Bay Coastal Wetlands project footprint and should be considered for project planning. These include:

- a. The Miami-Dade County Parks and Recreation Department, which presently owns and manages the Deering Estate, is seeking funding to implement what is essentially sub-component 1 of the Biscayne Bay Coastal Wetlands project. Miami-Dade County Parks and Recreation Department received funding in 2002 to begin the first phase of this restoration effort. This phase involves construction of a weir across Cutler Drain with the purpose of re-hydrating freshwater and mangrove wetlands on estate property. Miami-Dade County Parks and Recreation Department is seeking funding for Phase II of the project which will include extending the SW 160 Street Canal across Old Cutler Road and onto the estate, creating a 5-acre freshwater wetland on the Power's property, and constructing a weir at the end of the extended spur canal to control flow onto the estate. If funding is secured for Phase II, the Deering Estate sub-component will likely be removed from the Biscayne Bay Coastal Wetlands project.
- b. Florida Power and Light's Everglades Mitigation Bank is a 13,249 acre site located approximately 5 miles south of Florida City, just southwest of Florida Power and Light's Turkey Point Power Plant and east of U.S. 1. The Everglades Mitigation Bank consists of two major phases. Phase I contains 4,223 acres located between U.S. 1 and Card Sound Road and consisted primarily of exotic plant removal with no hydrologic enhancement. Phase I was permitted to operate as a mitigation bank in 1996. Phase II contains 9,026 acres located east of Card Sound Road extending to Card Sound then north along the L-31 Canal. An application for Phase II of this bank is currently under review by DEP and the Corps. Phase II will include a number of hydrologic enhancements to improve freshwater distribution to the Barnes Sound wetlands, including the placement of 40 culverts under L-31E from Card Sound Road to the power plant. The Biscayne Bay Coastal Wetlands selected plan must integrate the existing Florida Power and Light facilities (including the Everglades Mitigation Bank) with the proposed project features for the Biscayne Bay Coastal Wetlands area.

- c. The Miami-Dade Department of Environmental Resource Management's South Dade Stormwater Treatment and Distribution Area Pilot Project is in the early planning stages. The project involves exploring methods for hydrologic and biological restoration and enhancement on approximately 680 acres of degraded wetlands east of Homestead Air Reserve Base. The parcel is bisected by Military Canal and is bounded on the east by the L-31E canal. Miami-Dade County has completed preliminary engineering and hydrologic assessments and will construct a small-scale demonstration project on approximately 80 acres north of Military Canal to reroute canal water and promote sheet flow through the wetland. The pilot project includes a pump system to provide water to the wetland, construction of small distribution canals or flowways, elimination of existing drainage ditches and exotic vegetation, and monitoring. The intent of the project is to provide improvements in water quality and timing of freshwater discharges to Biscayne National Park and provide important information on the function of filtering wetland systems required for restoration on a more regional scale. The project site is entirely within the footprint of the Biscayne Bay Coastal Wetlands Project. It will help develop technical water quality, flood protection, and biological criteria needed to determine how much wetland area is required to treat or detain canal discharge. Construction is expected to start in January 2003 and be completed in June 2004. Operation and monitoring is anticipated to begin in August 2004 and last for 2 years.

Biscayne Bay Coastal Wetlands Project status

The Biscayne Bay Coastal Wetlands Project is in the early stage of developing a PIR. The PDT has a draft list of ecological and water quality performance measures and is currently formulating project alternatives. A hydrodynamic tool is being developed for simulating flow and salinity along the western margin of Biscayne Bay, and a hydrologic model is being developed for simulating ground and surface water in the adjacent wetlands. Neither of these tools have been calibrated or verified at this time, and are thus unavailable for use on the project. Accordingly, all habitat changes projected in this report are based on the project description appearing in the PMP, the MSRP, and best professional judgement regarding species habitat requirements and usage.

Land use and habitat types of the Biscayne Bay Coastal Wetlands Project

Table 28-1 below provides a list of the various land use and habitat types in the project area, along with estimates of the area (in acres) they occupy. FLUCCS codes (1995) were used to estimate habitat type potentially used by threatened and endangered species, as well as habitat areas potentially lost or gained upon completion of the project. A re-evaluation should be made using updated FLUCCS code GIS layers, when available, to more accurately classify land areas.

Table 28-1. Area estimation of land use and habitat types in the Biscayne Bay Coastal Wetlands Project area.

FLUCCS Code	FLUCCS Classification	Acres
411	Pine Flatwoods	246
426	Tropical Hardwoods	90
612	Mangrove Swamps	5,169
617	Mixed Wetland Hardwoods	3
618	Willows	15
	Mixed Shrubs	5,050
641	Freshwater Marshes	10,802
642	Saltwater Marshes	731
643	Wet Prairies	437
6411	Sawgrass	3,972
6412	Cattail	10
643	Wet Prairies With Pine	94
651	Tidal Flats	4,814
437	Australian Pine	666
422	Brazilian Pepper	5,677
424	Melaleuca	418
510	Streams and Waterways	972
524	Lakes less than 10 acres	12
200	Agriculture	4,996
100	Urban	1,187
800	Transportation, Communication, and Utilities	572
742, 743	Borrow and Spoil areas	93
530, 531, 532, 533	Reservoirs	103

Footprint of Biscayne Bay Coastal Wetlands project features

Table 28-2 lists the areas of impact to land use and habitat type based on project feature footprint specifications provided by the Corps (Brian Files, Project Engineer) and placement of these features as they appear in the PMP. For all pump stations, it is assumed that 4 acres will be effected, based on the footprint of a 575-cfs pump station utilized in the 8.5 Square Mile Area (footprint size of smaller pumps was not available). For new canals, a maximum canal width of 100 feet is assumed and a maximum levee width of 100 ft is assumed. For spreader swales, a maximum of 100 feet is assumed, with no associated levee. For seepage ditches associated with STAs, a maximum width of 50 feet is assumed. Risers are conservatively estimated to impact 0.1 acres per riser, with risers spaced every 2 miles along L-31E. Culverts are estimated to impact 0.1 acres per culvert, with culverts spaced approximately every quarter mile along L-31E.

The Service recommends that alternatives with more natural approaches be utilized where practicable (*e.g.*, gravity flow, culverts instead of pumps, etc.). Where unavoidable, project features such as pumps, roads, etc. should be placed in areas currently occupied by agriculture, existing levees, or areas dominated by invasive exotic vegetation. Placement of features in uplands, mangroves wetlands, and other wetland types having moderate to high functional value should be avoided. For construction and operations access, utilize existing roads where possible. The extensive canal system in the project area has functioning levee roadways that should be utilized in favor of building new roads.

Initial effects analysis for the Biscayne Bay Coastal Wetlands project

Several federally listed species are either known or anticipated to occur within the project area, and may be affected by the proposed action. Federally listed species known or anticipated to occur in the project area include the Florida panther, West Indian manatee, bald eagle, wood stork, American crocodile, eastern indigo snake, Schaus swallowtail butterfly, crenulate lead plant, Garber's spurge, and tiny polygala.

Areas bordering Card and Barnes Sounds have been designated as critical habitat for the manatee and the crocodile. Critical habitat for the manatee as it pertains to the project area is as follows: all waters of Card, Barnes, Blackwater, Little Blackwater, Manatee, and Buttonwood Sounds between Key Largo, Monroe County, and the mainland of Dade County; Biscayne Bay, and all adjoining and connected lakes, rivers, canals, and waterways from the southern tip of Key Biscayne northward to and including Maule Lake, Dade County. Critical habitat for the American crocodile includes all land and water within an area encompassed by a line beginning at the easternmost tip of Turkey Point, Miami-Dade County, on the coast of Biscayne Bay; southeast along a straight line to Christmas Point at the southernmost tip of Elliott Key; southwest along a line following the shores of the Atlantic Ocean side of Old Rhodes Key, Palo Alto Key, Angelfish Key, Key Largo, Plantation Key, Lower Matecumbe Key, and Long Key, to the westernmost tip of Long Key; northwest along a straight line to the westernmost tip of Middle Cape; north along the shore of the Gulf of Mexico to the north side of the mouth of Little Sable Creek; east along a straight line to the northernmost point of Nine-Mile Pond; northeast along a straight line to the point of beginning (Service 1999a).

Table 28-2. Biscayne Bay Coastal Wetlands project feature footprint effects on land use and habitat types (in acres).

Project Feature	Land Use/Habitat Type									
	Agriculture	Freshwater Wetland	Mangrove	Upland Forest	Urban	Waterway	Spoil (levee)	Rock Quarry	Brazilian Pepper	Wooded Wetland
Subcomponent 1										
Extend spur canal					1.5					
50cfs pump					4.0					
Spreader canal					1.8					1.5
Subcomponent 2										
Spreader swale		25.6		21.4	7.1					
200cfs pump (northern)					4.0					
200cfs pump	4.0									
STA	267.0	43.8			5.7				105.0	
STA levee	4.2**				7.8**				12.6**	3.2**
Seepage ditches for STA	11.2	1.8			0.2				4.4	
Subcomponent 3										
New canal west of landfill	19.4*									
	19.4**									
Risers under L-31E (8 total)						0.8				
Culverts under L-31 (16 total)						1.6				
Spreader swale east of L-31			40.3							
Backfill Military Canal						10.1	4.4			
Plug C-100B						2.5				
STA	304.0		24.0			6.8		106.0	330.0	3.8
STA levee	17.1**		1.6**		0.4**	0.4**		9.6**	17.8**	1.6**
Seepage ditches	12.7							3.4	6.3	
200cfs pump (C-102)									4.0	
200cfs pump (C-103)	4.0									

Table 28-2 continued.

Project Feature	Land Use/Habitat Type									
	Agriculture	Freshwater Wetland	Mangrove	Upland Forest	Urban	Waterway	Spoil (levee)	Rock Quarry	Brazilian Pepper	Wooded Wetland
Subcomponent 4										
200cfs pump (C-103)									4.0	
200cfs pump (Fla. City Canal)									4.0	
Risers under L-31E (3)						0.3				
Culverts under L-31E (6 total)						0.6				
New delivery canal									5.6*	
									5.6**	
Spreader swale			19.2							
Backfill North Canal						11.1	10.8			
STA	116.5				3.0				302.0	21.7
STA levee	8.9**				1.1**				14.3**	0.4**
Seepage ditches for STA	6.2								14.8	
Subcomponent 5										
50cfs pump									4.0	
New canal	4.8*								5.7*	
	4.8**								5.7**	
Spreader swale	15.5								1.5	

* habitat converted to canal (waterway)

** habitat converted to levee (spoil)

Florida panther

According to FWC telemetry data, panther #21 utilized approximately 23,417 acres of the project area between the Florida Power and Light cooling canals and Card Sound Road in 1988. Although the animal was killed subsequent to this tracking data, the portion of the project area it utilized remains suitable panther feeding and shelter habitat. Project effects to this area will likely be in the form of increasing the quality of freshwater wetland habitat by introducing more natural volumes of freshwater into this system, while leaving adequate high ground for panther resting and shelter habitat.

Harm: All project features of sub-component five and some from sub-component four will effect Primary/Dispersal Zone habitat in the area formerly utilized by panther 21. Primary/Dispersal Zone effects from sub-component 4 project features include 94.8 acres of row crops and 21.7 acres of wooded wetland. The sub-component four STA lies partially outside the panther zones, and effects in this non-panther habitat include 3.0 acres of urban and 27.9 acres of row crops. Impacts from sub-component five features include a new canal effecting 9.6 acres of row crops and a spreader swale impacting 15.5 acres of row crops, all in Primary/Dispersal Zone habitat.

Benefit: Construction of wildlife corridors beneath Card Sound Road should increase the safety of panther movements.

West Indian manatee

Manatees occur throughout Biscayne Bay on a year-round basis, but are most consistently observed in tributaries and nearshore seagrass beds, which are used as foraging areas. Their high mortality in water control structures as well as injuries caused by vessels is a major concern. Since the project may include back-filling existing canals where manatees have been observed and constructing new canals that connect to existing canals where manatees have been observed, the Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during project construction. Further guidance for structure design and manatee conservation is being developed by a multi-agency team.

Bald eagle

The Biscayne Bay Coastal Wetlands Project footprint is outside the Primary and Secondary Zones of known bald eagle nest sites. The most proximal site is located on West Arseniker Key, approximately 3.4 miles from the project boundary. The next closest known nest is located 13 miles northeast of the Deering Estate Flowway sub-component. However, construction of project features may potentially disturb eagles foraging outside nest zones. Back-filling sections of Military and North canals will eliminate 21 acres of foraging area (if these canals are back-filled). For new electrical lines near open water that may need to be installed for this project, the publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

Harm: Construction of spreader canals/swales, STAs, seepage ditches associated with STAs, installation of culverts and risers in L-31E, a plug in C-100B, and back-filling Military and North canals will result in a loss of 91.4 acres of freshwater wetlands, 83.5 acres of mangrove wetland, 33.8 acres of waterway, and 286.8 acres of wooded wetland. Since forested-open water habitat is located within 3 km of these areas, a total of 495.5 acres of potential foraging/nesting eagle habitat will be affected by project features.

Benefit: Construction of new delivery and spreader canals may provide an estimated 169 acres of new foraging habitat. Improved foraging habitat along the nearshore areas of western Biscayne Bay is also possible.

Wood stork

The Biscayne Bay Coastal Wetlands Project Area lies within the CFA of two wood stork colonies. The 2 CFA's are located approximately 16 and 18 miles northwest of the Deering Estate. All other project sub-components lie south and east of these two CFAs. Wood storks have been observed feeding in the project area near Florida Power and Light's Turkey Point Power Plant (Toby Obenaur, Biscayne National Park, personal communication 2003). The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and U.S. Fish and Wildlife Service *Supplemental Habitat Management Guidelines for the Wood Storks in the South Florida Ecological Services Consultation Area* should be consulted during project planning.

Harm: Construction of spreader canal east of Old Cutler Road in sub-component 1 will eliminate 1.5 acres of freshwater wetland in the two CFAs.

Benefit: Plans for extending the SW 160th St. Spur Canal will include the creation of a freshwater wetland on the west side of Old Cutler Road on what is referred to as the Power's property. Approximately 5 acres of freshwater wetland will be created which should be suitable foraging habitat for storks within the two CFAs identified above (estimated from Milian, Swain and Associates and CH2M Hill 2002).

Outside the CFAs, project features will adversely effect 769 acres of agriculture, 88.1 acres of freshwater wetlands and 83.5 acres of mangrove wetland. Enhancing freshwater wetlands and re-establishing brackish water conditions in the mangrove wetlands by redistributing freshwater flow and restoring more natural hydroperiods should increase the available prey base for wood storks, as well as other wading birds, throughout the project area. Total acres of wetlands to be enhanced is approximately 26,000 acres.

American crocodile

Crocodiles are known to exist throughout the project area at densities ranging from 0.0 to 0.29 crocodiles per 0.6 miles (Cherkiss 1999). Although no nests are known to occur within project boundaries, the cooling canals of Florida Power and Light's Turkey Point Power Plant, which

are in close proximity to project boundaries, support the most successful crocodile nesting population in south Florida (Mazzotti et al. 2002). Individuals from this population disperse northward and southward into the Biscayne Bay Coastal Wetlands Project area. Some have been seen as far north as the Miami River and Key Biscayne (M.S. Cherkiss, University of Florida, personal communication 2003). These cooling canals offer premium nesting habitat because they satisfy the two primary nesting requirements – suitable substrate that lies above the normal high water level and adjacent deep-water refugia. While crocodiles prefer sandy substrate, they will often utilize canal spoil banks (Kushlan and Mazzotti 1989).

One of the primary project objectives is to restore a more natural salinity gradient to the coastal wetlands. Watershed flow through conveyance canals has robbed these wetlands of vital freshwater for the last several decades, creating an unnaturally high salinity environment, which has caused a loss of grassy marshes and a landward migration of mangrove wetlands. Juvenile crocodiles require low salinities for growth and survival presumably because they have limited physiological capability to regulate their body fluids. The ideal salinity range for crocodiles is 0 to 20 ppt (Mazzotti et al. 2002). As salinity levels increase above 20 ppt, habitat suitability decreases. Redirecting freshwater from conveyance canals into the coastal wetlands will lower salinities there, which will increase suitable habitat for juvenile crocodiles.

As noted above, an extensive mosquito and drainage ditch system that interferes with historic flow patterns exists in much of the project area between the Deering Estate and Florida City Canal. This ditch system is a grid work of relatively shallow (less than one meter deep), closely spaced, north-south oriented mosquito ditches that are crossed by larger, deeper (up to 2 m deep), and more widely spaced (every 400 m) east-west oriented drainage ditches. The smaller mosquito ditches are particularly disruptive to flow, and to restore a more natural flow pattern in this area, some or all of these ditches should be filled. Because the mosquito ditches are relatively shallow, they offer little, if any, crocodile refuge. Restoring a more natural flow across these ditches should enhance the restoration of the mangrove wetlands by providing a more stable brackish water condition, which will enhance overall crocodile habitat. The larger east-west drainage ditches are more suitable as crocodile refuge areas, and backfilling these ditches could eliminate potential deep water crocodile refuge. However, it is unclear at this time if any of these ditches will be backfilled, and it is highly likely that some will be integrated into the restoration of the historic creek systems in this area. For purposes of this report, we will assume that these larger ditches will remain open.

Harm: Back-filling sections of Military and North canals will eliminate 21 acres of deep water feeding habitat and deep water refugia (if these canals are back-filled). Installation of culverts and risers along L-31E, a plug in C-100B, and creation of STAs will also eliminate 3.3, 2.5, and 6.8 acres, respectively, of feeding habitat and refugia. Back-filling these canals with adjacent levee material will eliminate 15.2 acres of basking/possible nesting habitat provided by the levee. No nesting sites are known to exist near either of these canals, and this area would be restored to natural wetlands providing crocodile habitat, so no loss of habitat will be tallied for this report. Project features such as spreader swales and STAs will eliminate 83.5 acres of mangrove forest that is considered viable crocodile habitat.

Benefit: Construction of new delivery and spreader canals may provide an estimated 169 acres of new deep water feeding habitat and deep water refugia. Levees associated with delivery canals may provide 36 acres of suitable nesting habitat. Restoring brackish water conditions in coastal wetlands will greatly increase suitable juvenile and adult habitat throughout the coastal wetlands. Estimated area of enhancement to the brackish water zone is approximately 10,700 acres.

Eastern indigo snake

Indigo snakes are known to occur in the project area. They are regularly sighted along some of the levees, particularly the L-31E levee (J.F. Meeder, Florida International University, personal communication 2003). Indigo snakes utilize a wide variety of habitats, including various wetland types, many of which are found in the Biscayne Bay Coastal Wetlands Project area. However, at least one herpetologist familiar with the project area believes that the indigo snakes occurring in the project area comprise what is essentially an artificial population; *i.e.*, they are present only because manmade structures such as levees and other artificial topographic highs have made the area inhabitable (G.H. Dalrymple, The Everglades Group, personal communication 2003). This project area is at the southern extreme of the indigo snake's range, and the indigo snakes in this area may be surviving in sub-optimal environments. Dalrymple believes this population is on the brink of extinction and the redirection of water from canals into wetlands may reduce or degrade feeding habitat in this area enough to eliminate the population. The Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Harm: As detailed in Table 28-2, additional canals, removal of existing levees, installation of spreader swales, seepage ditches for STAs, new pump stations and installation of culverts and risers will eliminate 2,146.2 acres of indigo snake habitat. Increased water levels and hydroperiods in the adjacent wetlands is likely to result in less favorable habitat for indigos.

Benefit: Backfill of canals, creation of levees associated with the new delivery canals, and construction of STAs with interspersed upland levees will create 1,841 acres of new indigo snake habitat.

Schaus swallowtail butterfly

This endangered species occupies only one small area within the project boundary—the hardwood hammock on the Deering Estate (Sub-component 1). This insect was reintroduced to the estate in 1995 (Service 1999a). According to project plans, the weir in Sub-component 1 will likely be placed just east of the hardwood hammock that supports the reintroduced butterfly. The Miami-Dade County Parks and Recreation Department, which owns and manages the estate, estimates that 5 acres of hammock habitat will be affected by water pooled in Cutler Slough after the weir is installed. We anticipate that increased hydration will have a positive effect on the flora associated with the hammock, including the wild lime and torchwood that Schaus butterfly larval stages utilize as a food source (Dr. Tom Emmel, University of Florida, personal

communication 2003). We also anticipated that an increase in freshwater will increase the abundance of nectar plants upon which adults feed.

Harm: None anticipated.

Benefit: Approximately 5 acres of foraging habitat may be enhanced.

Crenulated lead plant, Garber's spurge, Tiny polygala

These species are primarily associated with pine rocklands (Chafin 2000). Approximately 150 acres of pine rocklands exist in the project area on the Deering Estate. Project features and design for Sub-component 1 should not affect pine rocklands habitat on the estate. The crenulated lead plant may also occur in marl prairies (transverse glades) with slash pine, saw palmetto, wax myrtle, and poisonwood, and tiny polygala is sometimes found in scrub, sandhill, and open coastal spoil piles (Chafin 2000). The Service has determined that these habitat types either do not exist in the project area, or it is highly unlikely that the listed plants will occur in these habitats. Other habitats in which these plants are sometimes found, including marl prairies with slash pine, saw palmetto, wax myrtle, and poisonwood, scrub habitat, sandhill, coastal barrens, and beach ridges (Chafin 2000) are not known to exist in the project area.

Harm: None anticipated.

Benefit: None anticipated.

Coordination with the Corps and the District for the Biscayne Bay Coastal Wetlands Project

February 27, 2003. Project description e-mailed to the Corps and District project managers for review and consent.

March 7, 2003. Estimates of project feature footprints were requested from Brian Files, the Project Engineer.

March 17, 2003. Brian Files was contacted again with the request for estimates of project features areas and sizes. He recommended using a minimum of 100 feet as new canal widths.

March 18, 2003. Brian Files e-mailed specifications for pump station footprint and riser footprint (4 acre for pump station, 0.1 acre per riser).

March 21, 2003. Left voice mail for B. Files for further project feature footprint information.

March 24, 2003. Telephone conversation with Eric Holland (Corps Engineer) informed me about the usage of Obermeyer Structures, a new water control structure, that is very manatee friendly; and the use of 50 feet as a maximum width for seepage ditches.

Section 7 consultation documents

March 25, 2002. PAL recommending inclusion of crocodile and manatee studies in the PMP.

June 21, 2002. PAL that included a preliminary threatened and endangered species list, among other items.

December 24, 2002. PAL addressing hydrodynamic/hydrologic modeling issues.

June 5, 2003. PAL documenting ecological performance measures to which the Service contributed significantly or took the lead role in developing.

29 C-111 Spreader Canal

Background

The C-111 General Reevaluation Report with integrated Environmental Impact Statement was completed and approved by the Corps in 1994, prior to the C&SF Restudy. This project continued efforts initiated by the C-111 Interim Plan by recommending additional modifications to the C&SF Restudy. Hydrologic conditions in Taylor Slough would be improved with the addition of four pumps and a tie-back levee in the Frog Pond and Rocky Glades areas. In the lower C-111, modifications were proposed to increase freshwater flows to the panhandle of ENP and to Florida Bay. These modifications were conceived to divert water from the C-111 to the east, into the Southern Glades area, and south into the marshes of ENP. Proposed features of the lower C-111 included:

- a. Construction of a 50-cfs capacity pump station (S-332E) at the junction of C-111 and C-111E.
- b. Construction of a spreader canal from S-332E east to U.S. 1.
- c. Placement of plugs in C-109 and C-110.
- d. Removal of 54 spoil mounds along the southern bank of the lower C-111 canal.

The C-109 canal was backfilled by the Florida Department of Transportation to mitigate for the impact of road improvements to U.S. 1. Since the completion of backfilling in 1995, natural vegetation has been reestablished in the former canal location. The removal of the spoil mounds and the filling of six gaps at the end of the C-111 were completed in 1998. The spoil material was stockpiled in the Frog Pond for future construction of the L-31W tie back levee in the Rocky Glades. The regrading of the south bank of the lower C-111 produced an immediate redistribution of freshwater to ENP by inducing over bank flows along the 3-mile stretch where the mounds had been removed. The remaining features of the 1994 design (pump station S-332E, spreader canal, and plugs for C-110) have not been constructed. The CERP C-111 Spreader Canal Project uses the unconstructed portion of the C-111 General Reevaluation Report design as the foundation for additional features that will extend the restoration benefits to the Model Lands area between U.S. 1 and Card Sound Road.

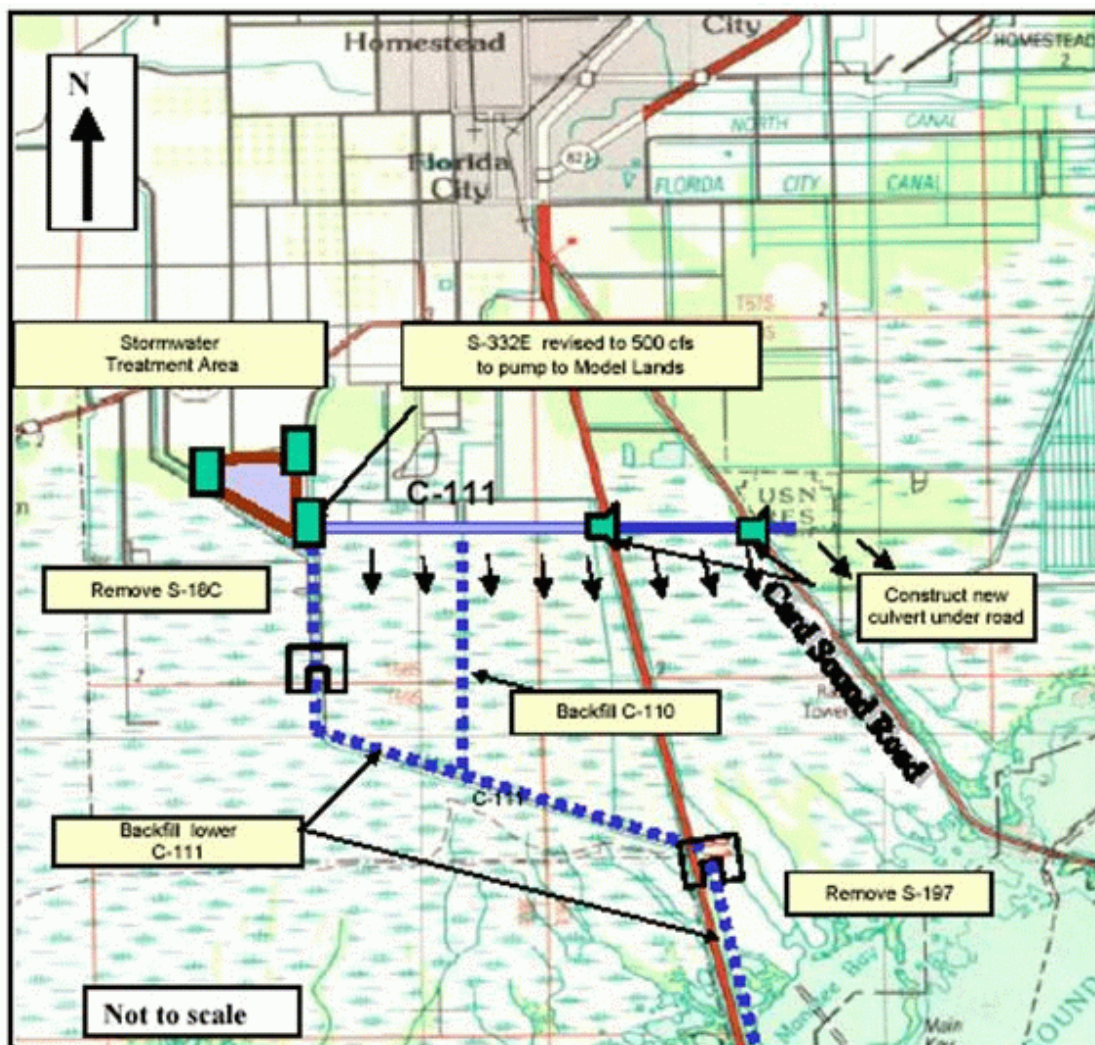
C-111 Spreader Canal project description

The CERP C-111 Spreader Canal Project includes levees, canals, pumps, water control structures, and an STA that will be constructed, modified, or removed in the Model Lands and Southern Glades (C-111 Basin) area of Miami-Dade County. The C-111 Spreader Canal Project enhances the C-111 General Reevaluation Report design with the following proposed features:

- a. Design and construct a new STA.
- b. Increase the capacity of pump station S-332E to 500 cfs.
- c. Extend the spreader canal under U.S. 1 and Card Sound Road.

- d. Place culverts under U.S. 1 (part of Florida Department of Transportation road work).
- e. Backfill C-110.
- f. Fill C-111 between S-18C and S-197.
- g. Remove S-18C and S-197.
- h. Acquire lands needed to construct the STA, to construct the spreader canal system, and to protect lands affected by hydrologic improvements that will occur to the south of the lower C-111 and east of U.S. 1 in the Model Lands. Preliminary estimates indicate that a minimum of 6,100+ acres may be acquired.

Figure 29-1. Schematic of the C-111 Spreader Canal Project features as conceptualized in the Comprehensive Everglades Restoration Plan (Figure 1; Corps 2002).



The C-111 Spreader Canal Project features (project size, location, and configuration of the STA, pump station, and spreader canal) as conceptualized in the CERP (Fig. 29-1) are being reevaluated in the PDT process and will be documented in the PIR.

Project footprint

Figure 29-2 illustrates the generalized existing vegetation zones in the project area. The project footprint as it can be best conceptualized based on the C&SF Restudy includes the following features:

1. The proposed C-111 spreader canal footprint is 6.5 miles long, with an estimated 300-foot wide impact area representing approximately 236 acres in the sawgrass and tree island vegetation zone.
2. The proposed backfill of C-111 and C-110 footprint is 14.6 miles long, with an estimated 300-foot wide impact area representing approximately 529 acres. This includes 254 acres sawgrass and tree island, 132 acres in fresh and saltwater ecotone, 116 acres in sawgrass with tree islands, and 26 acres in mixed grassy species with mangroves.
3. The proposed STA footprint is 3,200 acres (Corps 2002f). Of this area, 34 percent (1,088 acres) is in shrub-dominated freshwater marsh, and 66 percent (2,112 acres) is in sawgrass with tree islands.
4. Placement of culverts under U.S. 1 (part of Florida Department of Transportation road work) will have the following estimated footprint:
 - a. Florida panther crossings (three) - 0.04 acres total in shrub-dominated freshwater marsh;
 - b. American crocodile crossings (15) - 0.2 acres total in fringe mangroves; and
 - c. hydrologic connections (25) - 0.17 acres total distributed throughout the length of the project.

**Existing vs. Future Projected Vegetation (Generalized)
South Dade Wetlands (C-111/Model Lands Basins)**

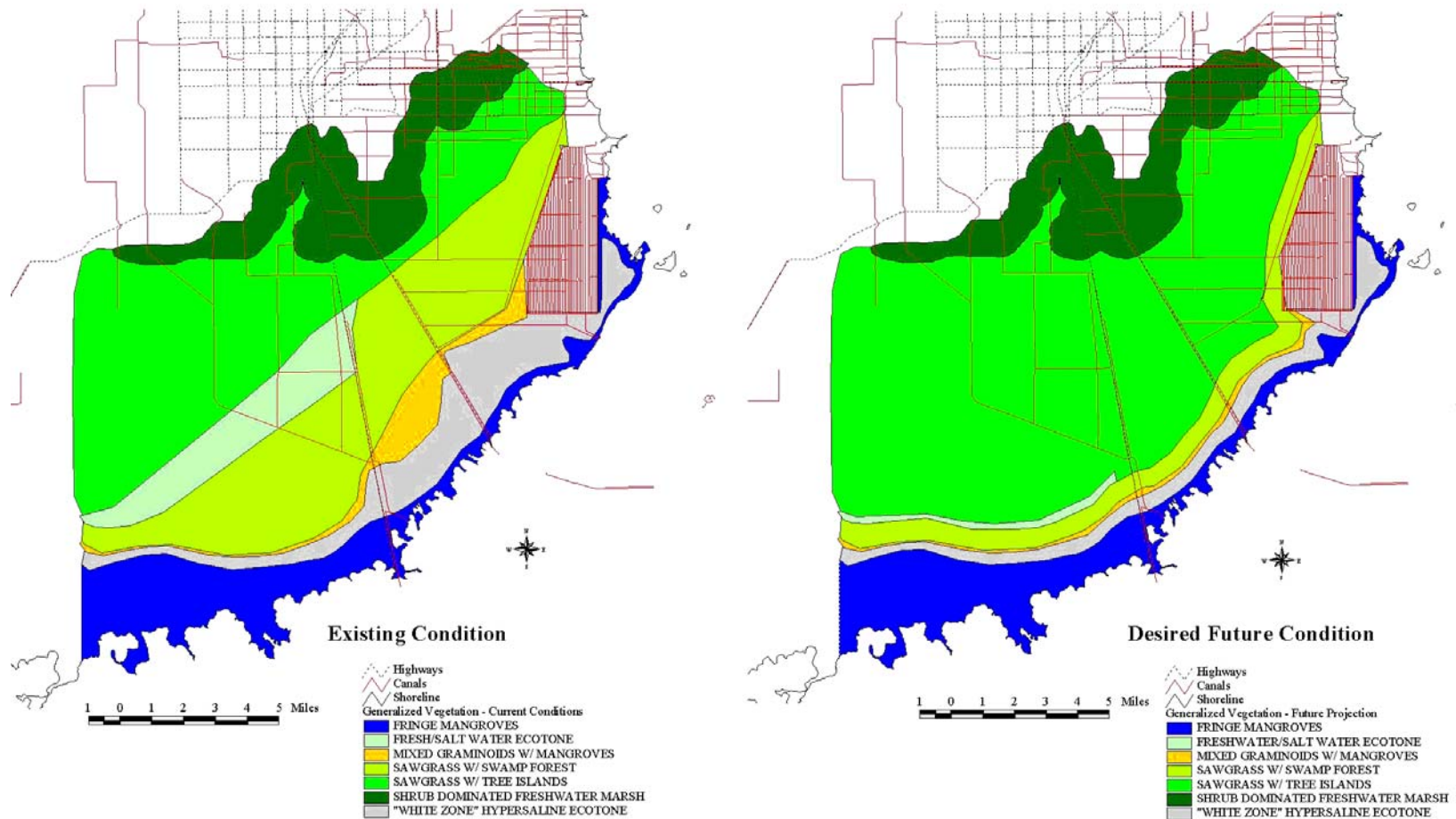


Figure 29-2. Existing vs. predicted vegetation for the C-111 Spreader Canal Project area.

Initial effects analysis for the C-111 Spreader Canal Project

Cape Sable seaside sparrow

No documentation of the Cape Sable seaside sparrow has been made within the project footprint. Approximately 15,500 acres of designated Cape Sable seaside sparrow critical habitat are within the area likely influenced by the C-111 Spreader Canal Project. Backfill of the lower C-111 canal would likely effect a footprint of 62 acres within the canal and levee bank corridor that borders this critical habitat area. Since the canal and levee bank corridor do not represent preferred habitat for the Cape Sable seaside sparrow, the 62-acre backfill will not be counted as an impact. However, Cape Sable seaside sparrows have been documented in the vicinity of the lower C-111 canal as recently as surveys in 2000. Equipment activity and noise during backfill activities have the potential to create a temporary disturbance to Cape Sable seaside sparrows in the area. The Corps has agreed to implement measures to avoid adverse effects due to construction disturbance; therefore, no adverse effects are expected. The STA and C-111 spreader canal footprints will not directly effect Cape Sable seaside sparrows.

Wood stork

None of the footprint acres for the C-111 Spreader Canal Project is within the Primary or Secondary Zones for known wood stork colonies. The C-111 Spreader Canal Project area is suitable foraging habitat for wood storks and within the maximum 18.6-mile CFA of documented nesting colonies outside the project area. Almost all of the freshwater marsh and estuarine areas in the C-111 Spreader Canal Project can be considered suitable wood stork foraging habitat. Approximately 6,100 acres of this habitat will be acquired as part of the project. Within that 6,100 acres, construction of the C-111 spreader canal will convert approximately 236 acres in the sawgrass and tree island vegetation zone to deeper, open-water habitat not suitable for wood stork foraging. Conversely, the proposed backfill of C-111 and C-110 footprint would benefit the wood stork by converting an estimated total of 529 acres of deeper, open-water habitat and levee banks in the canal system to shallower, shorter hydroperiod wetland habitat types that would offer seasonal foraging habitat. This assumes complete leveling and backfilling of the canal and levee system to a level similar to surrounding habitat conditions, a return to a more natural sheetflow condition, and recovery of native marsh vegetation. The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and U.S. Fish and Wildlife Service *Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning.

The proposed STA footprint of 3,200 acres would replace an estimated 1,088 acres of shrub-dominated freshwater marsh and 2,112 acres in sawgrass and tree islands with flooded wetland habitat of varying depths. Observations of wood stork utilization of STAs in other areas are encouraging, but operating criteria for the STA will determine final wood stork usage. For purposes of this analysis, STAs are not expected to provide reliable habitat and will not be counted as stork habitat.

An estimated 0.4 acres of roadside fringe foraging habitat effected by culvert installation along U.S. 1 would cause a small negative effect on wood stork foraging habitat, but would be more than offset by the overall habitat benefits created by the hydrologic reconnection across the highway. In total, 3,436 acres will be effected and the remaining 2,664 acres will provide a benefit to the wood stork as it is restored and managed as wetland foraging habitat.

Everglade snail kite

No designated critical habitat for the snail kite is found within the C-111 Spreader Canal Project area. Wetlands in the Everglades region supporting the snail kite include Taylor Slough and the C-111 basin west of U.S. 1. Approximately 6,100 acres of potential kite habitat will be acquired as part of the project. Within that 6,100 acres, construction of the C-111 spreader canal would convert approximately 236 acres in the sawgrass and tree island vegetation zone to deeper, open-water habitat not suitable for snail kite foraging except for a narrow band along the shoreline. The proposed backfill of C-111 and C-110 footprint would benefit the snail kite by converting an estimated total of 529 acres of deeper, open-water habitat in the canals to shallower, shorter hydroperiod wetland habitat types that would offer seasonal foraging habitat. This assumes complete leveling and backfilling of the canal and levee system to a level similar to surrounding habitat conditions, a return to a more natural sheetflow condition, and recovery of native marsh vegetation.

The proposed STA footprint of 3,200 acres will replace an estimated 1,088 acres of shrub-dominated freshwater marsh and 2,112 acres of sawgrass with tree islands with flooded wetland habitat of varying depths. Snail kites have been observed to utilize STAs in other areas, but the operating criteria for the STA will determine usage of the area. For purposes of this analysis, STAs are not expected to provide reliable habitat and will not be counted as snail kite habitat.

The 0.4 acres of roadside fringe foraging habitat effected by culvert installation along U.S. 1 will be insignificant and will be offset by the overall habitat benefits created by the hydrologic reconnection across the highway. In total, 3,436 acres will be effected and the remaining 2,664 acres will provide a benefit to the snail kite as it is restored and managed as wetland foraging habitat.

Eastern indigo snake

The eastern indigo snake utilizes a wide variety of habitat types in southern Florida. Therefore almost the entire C-111 Spreader Canal Project area can be considered suitable indigo snake habitat except for deeper water areas such as canals, tidally influenced mangrove and estuarine areas, and roads. Approximately 6,100 acres of this habitat will be acquired as part of the project. Within that 6,100 acres, construction of the C-111 spreader canal would convert approximately 236 acres in the sawgrass and tree island vegetation zone to a canal system that would include deeper open-water habitat not considered suitable for eastern indigo snakes. The canal system would include a narrow band along the shoreline and the canal banks that could be considered acceptable habitat. In contrast, backfilling the C-111 and C-110 canals by pushing

their associated levees back into the canals would create habitat in the case of filling the canals, but reduce habitat quality in the case of eliminating the levees. Assuming that the canal and levee system is restored to resemble the surrounding topography and assuming that native marsh vegetation recolonizes the project footprint, then 225 acres of habitat would be created by filling in the canals, but 304 acres of upland habitat would be removed by degrading the levees and replaced by marsh habitat. Road mortality could occur if the existing levee is used for equipment access to the construction area during either removal of the existing levee and canal or construction of the C-111 spreader canal.

The proposed STA footprint of 3,200 acres would replace an estimated 1,088 acres of shrub-dominated freshwater marsh and 2,112 acres in sawgrass and tree islands with flooded wetland habitat of varying depths. Eastern indigo snakes have been observed to utilize STAs in other areas, but operating criteria for the STA will determine usage of the area. Assuming that the STA is constructed with multiple cells formed by levees that provide interspersed uplands, the STA for purposes of this analysis will be treated as acceptable eastern indigo snake habitat.

The 0.4 acres of roadside fringe foraging habitat effected by culvert installation along U.S. 1 would be insignificant and will be offset by the overall habitat benefits created by the hydrologic reconnection across the highway. In total 236 acres will become unsuitable post-project and the remaining 5,864 acres will be suitable indigo snake habitat in public ownership with long-term management to maintain suitable conditions.

Indigo snakes could be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Florida panther

The designated Primary/Dispersal Zone for Florida panther habitat encompasses a large portion of the C-111 Spreader Canal Project area including the 6,100 acres to be acquired for the project, the existing C-111 canal and levee, the proposed C-111 spreader canal location, and the proposed STA location. The proposed STA footprint of 3,200 acres in its currently proposed location will replace an estimated 1,088 acres of shrub-dominated freshwater marsh and 2,112 acres of sawgrass and tree islands with flooded wetland habitat of varying depths that is high quality panther habitat.

Construction of the C-111 spreader canal would convert approximately 236 acres in the high quality sawgrass and tree island vegetation zone to a canal system that would include deeper, open-water habitat not considered suitable for Florida panthers. In contrast, backfilling the C-111 and C-110 canals by pushing their associated levees back into the canals would create habitat in the case of filling the canals. Assuming that the canal and levee system is restored to resemble the surrounding topography and assuming that native marsh vegetation recolonizes the project footprint, then 225 acres of high quality habitat would be created by filling in the canals.

In total, 3,436 acres of high quality habitat would be lost and 2,664 acres of high quality habitat would be acquired, restored and managed as natural habitat.

Bald eagle

No recent bald eagle nesting activity has been recorded in the C-111 Spreader Canal Project area. Suitable foraging habitat for bald eagles does exist throughout the project area.

Components of the project footprint such as creation of the C-111 spreader canal would produce 236 acres of new suitable foraging habitat. The 225 acres of existing canals to be filled in would result in a loss of foraging habitat. Construction of the STA could result in positive habitat changes for bald eagles by creating 3,200 acres of large, open water bodies and banks, but this is dependent on the availability of open-water (no emergent vegetation) and suitable perch and nest sites. Since we do not currently know that the STA will include open water components, this potential habitat will not be tallied for purposes of this report. New electrical lines would be needed associated with the installation of pumps near open-water and water control structures. These could present an electrocution hazard for eagles and the publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

The 0.4 acres of marginal roadside fringe habitat effected by culvert installation along U.S. 1 would cause a potential small negative effect on bald eagles, but will be more than offset by the overall habitat benefits created by the hydrologic reconnection across the highway.

American crocodile

Critical habitat designated for the American crocodile encompasses almost the entire C-111 Spreader Canal Project area except for the proposed STA location. Estuarine and deepwater canal areas in the C-111 Spreader Canal Project area can be considered suitable American crocodile habitat. Construction of the C-111 spreader canal will convert approximately 236 acres in the sawgrass and tree island vegetation zone to a canal system that would include deeper open-water and canal banks that could be considered acceptable habitat based on documented crocodile usage of similar areas. In contrast, the proposed backfill of the C-111 and C-110 footprint would convert an estimated total 529 acres of canals that provide foraging habitat and levees that provide resting and possible nesting habitat to shallower, shorter hydroperiod wetland habitat types that are not likely to be used by crocodiles.

The 0.4 acres of marginal roadside fringe crocodile habitat effected by culvert installation along U.S. 1 may represent a small loss of habitat, but will be more than offset by the overall habitat benefits created by the hydrologic reconnection across the highway and the inclusion of three crocodile crossings in documented crocodile use areas.

West Indian manatee

There is no designated critical habitat for the West Indian manatee within the footprint of the C-111 Spreader Canal Project area as currently proposed. Manatees have historically been documented in the lower C-111 canal as far north as S-177 and have access north of S-197 in the C-111 canal when flow is allowed through S-197 culverts. Manatees have infrequently been documented moving into the C-111 canal, apparently through the Lake Okeechobee system by way of the L-33, L-30, and L-31N canals. The proposed backfill of the C-111 canal under the current project proposal would end at S-197, leaving the lower C-111 canal from below S-197 to Manatee Bay unaffected by construction. Depending on how the canal is backfilled, manatees could become trapped or may be directly harmed through construction activities. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented in areas accessible to manatees.

Currently, fresh water seeps into the C-111 canal below the S-197 structure, thereby attracting manatees. It is possible that backfilling the C-111 canal would reduce this seepage, thus making this part of the C-111 canal less attractive to manatees; however, this reduction may be offset once sheetflow is enhanced by the spreader canal. This issue warrants further investigation during project planning.

Coordination with the Corps and the District for the C-111 Spreader Canal Project

March 8, 2001. PDT Meeting
 March 28, 2001. Project Technical Scope Formulation Meeting
 April 25, 2002. PIR PDT Kick-off Meeting
 June 24, 2002. Performance Measures Workshop/PDT Meeting
 July 10, 2002. E-Mail: Draft PAL terminology
 July 24, 2002. Performance Measures Workshop/PDT Meeting
 September 9 2001. E-Mail: Draft list of water quality parameters/performance measures
 September 12, 2002. PDT Meeting
 October 4, 2002. E-Mail: Documentation of C-111 Ecological Subteam work tasks
 October 17, 2002. C-111 Spreader Canal, South Dade Wetlands PDT Field Trip
 October 18, 2002. PDT Ecological Subteam Meeting
 October 28, 2002. PDT meeting.
 December 11-12, 2002. PDT Ecological Subteam meeting.
 December 16, 2002. PAL: Service comments on C111 Spreader Canal Project.
 January 23, 2003. PDT joint C-111/Biscayne Ecological Subteam meeting.
 January 4 2003. PDT joint C-111/Biscayne Ecological Subteam meeting.
 March 5, 2003. PDT meeting.
 March 18, 2003. E-Mail: Coordination of C-111 Spreader Canal Project description.
 April 1, 2003. Submitted recession rates for wading birds performance measure to PDT.
 April 10, 2003. PDT, Water quality/Ecological subteams meeting.
 April 15, 2003. Submitted draft recommendations for recreational opportunities/constraints.
 May 1, 2003. PDT meeting.
 May 30, 2003. PDT, Water quality/Ecological/Modeling Subteams meeting.
 June 5, 2003. PDT, Water quality/Ecological Subteams meeting.

July 1, 2003. PDT, Ecological Subteam meeting.

August 1, 2003. PDT, Ecological Subteam meeting.

August 7, 2003. PDT meeting.

August 22, 2003. C-111/Biscayne Bay PDT, Ecological Subteams meeting.

September 9, 2003. PDT, Ecological Subteam meeting.

Section 7 consultation documents

No Section 7 consultation has occurred to date as part of this project.

30 Southern Golden Gate Estates Hydrologic Restoration Project

Southern Golden Gate Estates Hydrologic Restoration Project description

The Southern Golden Gate Estates (SGGE) Restoration Project area as shown in Figure 30 -1 covers about 94 square miles (60,160 acres) in southwestern Collier County, Florida between Interstate 75 and U.S. Highway 41. The SGGE Restoration Project is located southwest of the Florida Panther National Wildlife Refuge, north of the Ten Thousand Islands National Wildlife Refuge/National Estuarine Research Reserve/Aquatic Preserve, east of the Belle Meade tract of the Picayune Strand State Forest, and west of the Fakahatchee Strand State Preserve. The SGGE Restoration Project, in combination with the Belle Meade Tract, will be managed as the Picayune Strand State Forest. The Faka Union Watershed, which includes SGGE and part of Northern Golden Gate Estates, encompasses approximately 189 square miles with a network of 70 miles of drainage canals, including four major canals that extend into the SGGE Restoration Project: Miller, Faka Union, Merritt and Prairie.

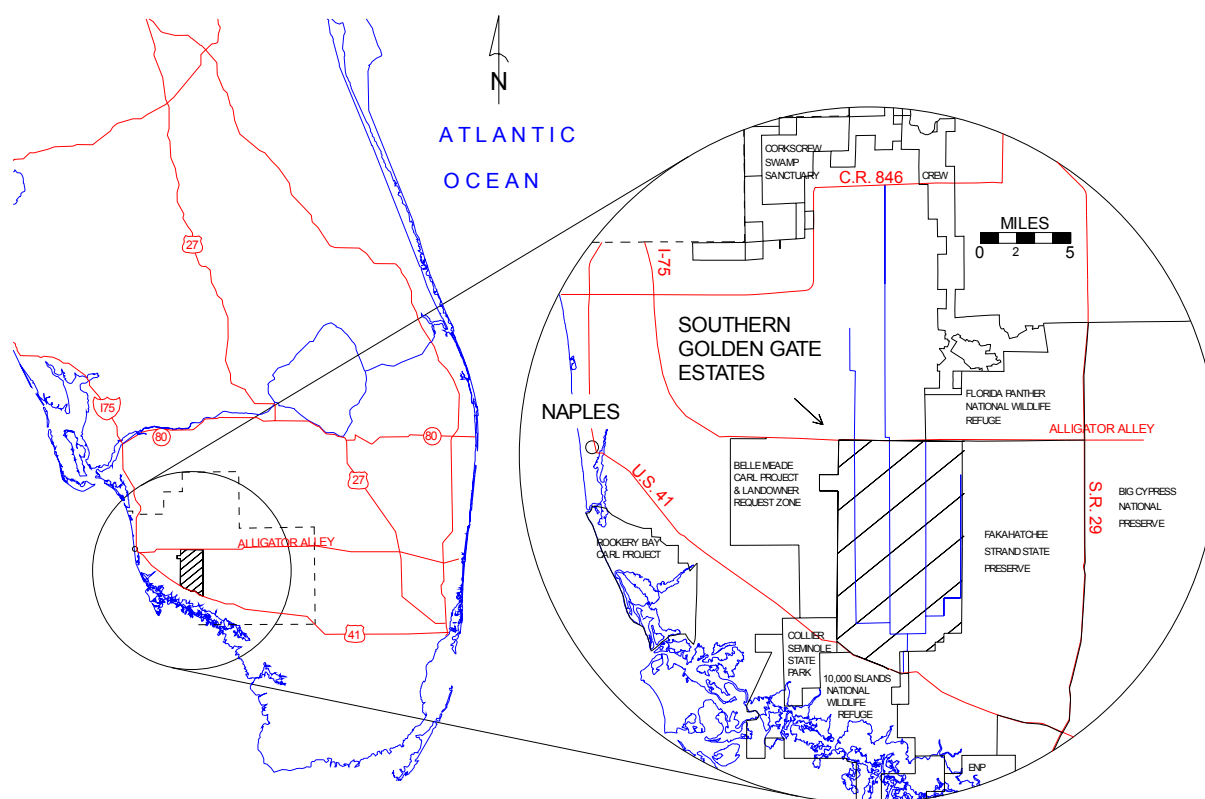


Figure 30-1. Location of the Southern Golden Gate Estates Restoration Project area. This project area covers about 94 square miles (60,160 acres) in southwestern Collier County, Florida between Interstate 75 and U.S. Highway 41 (Corps 2002g).

The purpose of the SGGE Restoration Project is to restore altered hydrologic function to a defunct 1960's real estate subdivision. The SGGE subdivision originally included 22,000 lots with more than 17,000 individual landowners scattered worldwide. Development of the SGGE subdivision created about 48 miles of major canals and 279 miles of primary and secondary roads.

The specific objectives of the SGGE Restoration Project as outlined in the *Preliminary Draft of the Integrated Project Implementation Report and Environmental Impact Statement* (Corps 2003 b) are:

1. to re-establish natural freshwater flows to the estuary;
2. restore historic hydropatterns, including sheetflow and flowways;
3. re-establish natural plant distribution and composition;
4. increase surface aquifer recharge;
5. restore habitat for listed species;
6. restore ecological connectivity and provide contiguous habitat protection to adjacent public lands;
7. provide resource-based recreational opportunities compatible with the protection of the natural system; and
8. restore natural fire regime.

The implementation of the SGGE Restoration Project is entirely contingent upon acquisition of lands. The Department of the Interior and the DEP executed a grant agreement under the Farm Bill (Section 390 of the Federal Agriculture Improvement and Reform Act of 1996, Public Law 104-127), which gave DEP \$25 million in federal funds to acquire approximately 20,250 acres in the SGGE. The Farm Bill Grant Agreement with DEP provides that conservation lands acquired under the agreement will be used and managed for conservation purposes within the scope of authorities of the Farm Bill and the FWCA. The framework agreement requires that all Farm Bill funds spent on land acquisition will be matched by non-federal funds on a dollar-by-dollar basis.

Description of Alternatives

As a result of several studies of the Golden Gate Estates area, the Governor of Florida requested in 1992 that the District develop a conceptual hydrologic plan for the SGGE to enhance the environmental value and water resources of the region. Five alternatives were developed and evaluated, and their ability to meet the project objectives was evaluated by model simulation. The alternatives 1, 2, 3A, 3B, and 3C ranged from partial/incremental restoration to the full-scale approach of construction of spreader channels, swale and road removal, placement of canal blocks, and pump stations. Alternative 3D was subsequently developed to determine the changes in benefits associated with partial and total road removal. Following an evaluation of costs associated with 3D, additional alternatives were developed. Alternative 4 looked at the effects of the sizes of the bridges at I-75. Alternative 6 was a no-pump alternative. Alternative 7 relocated spreader channels and canal blocks southward. Alternative 8 allowed two canals to be

open during storms and Alternative 9 left one canal open during storms to maintain the existing flood protection for Northern Golden Gate E.

Alternative 3D (spreader channels, canal blocks, and 270 miles of road removal) is the most extensive alternative being considered, and has the largest “footprint” and potential impact area. Therefore, assessment of this alternative would reasonably reflect the potential project effects to listed species.

Alternative 3D includes construction of 83 earthen canal plugs, and the demolition of 254 miles of roads. About 25 miles of existing roads would remain, and about 26 miles of roads would be removed to ambient grade and maintained for management purposes (*Draft Florida Division of Forestry Road Plan*, February 2003). Three spreader channels will be constructed in an east-west direction, across Miller Canal at 64th Avenue, the Faka Union Canal at 66th Avenue, and the Merritt Canal at 54th Avenue. Three pump stations would be constructed and sized so that the existing level of service for flood protection in Northern Golden Gate Estates would not be reduced. In order to maintain the existing level of flood control, the pump stations would convey 1,000 cfs on the Miller canal, 2000 cfs on the Faka Union canal, and 800 cfs on the Merritt Canal.

Alternative footprint features

SGGE Restoration Project alternative designs discussed to date include the following design features.

1. **Spreader Channels and Berms.** The spreader channel is designed to receive flow from north-south canals and redirect this flow in an east-west direction. The channel will then redistribute flow in a broad shallow front across the land surface, usually by overtopping the downstream bank and discharging onto the land surface. The water surface elevation in the spreader channel is “stepped up” by pumping across a berm from an intake canal located north of the berm. Water is prevented from backing up to the north by the berm and by natural topography. The length of the three spreader channels associated with Alternative 3D is 12,593 feet. The width of construction associated with this feature is 60 feet, therefore effects to 17 acres of habitat are associated with the spreader swale design. No cross-sections are available for an intake canal or berm associated with this spreader channel. However, estimating a 60-foot intake canal and 50-foot berm for a distance of 12,593 feet, total habitat impacts associated with this feature could be 49 acres. The majority of this impact would be to pine flatwoods and cabbage palm forest. It is estimated that approximately 4 miles of roadway construction may be associated with construction of this feature. Additional roadway is anticipated to be constructed on existing road rights-of-way or berms, therefore no additional habitat effects are expected.
2. **Pump Stations and Pumps for Restoration.** Pump stations are an integral part of the spreader channel system. Pumps are necessary to move water from the low elevation of the canals that enter SGGE from the north to the spreader channel. Pumps are sized based on the wet

season monthly average flows entering SGGE from Northern Golden Gate Estates through the Miller, Faka Union, and Merritt canals. Pump stations will be constructed on berms in association with the spreader and berm design as described above. No additional habitat effects are expected.

3. Flood Mitigation Pumps for Northern Golden Gate Estates. Elimination of the gravity drainage system south of I-75 in the Faka Union Basin will require flood mitigation pumps to maintain the existing level of service for flood protection for the area north of I-75. Flood mitigation pumps would be co-located with the pump stations and pumps for restoration. Pump stations will be constructed on berms in association with the spreader and berm design as described above. No additional habitat effects are expected.
4. Road Demolition. Roads in SGGE are elevated a few inches to a foot above the adjacent ground and they intercept water that would otherwise flow across the ground surface. Roads also provide disturbed habitat which serves as introduction sites for exotic plant species like Brazilian pepper. Ditches located parallel to the roads intercept surface and groundwater and limit historic flow patterns. Road demolition is defined as reducing the elevation of the road to match the adjacent land surface. Material would be pushed aside and leveled. The road material would not be entirely removed from the area. Roads crossing major flowways are considered top priority for removal. A 150-foot clearing limit is estimated for paved and unpaved roadway demolition or degradation. Of this 150 feet, approximately 20 feet are paved or filled road surface, 30 feet are roadside swales, and about 60 feet are spoil berm or rocks. Estimated maximum impacts to habitat associated with degradation of roads for a maximum of 70 feet (150 feet minus road and spoil berm) for 254 miles of roadway is 8.5 acres per mile of roadway or 2,153 acres. Of this 2,153 acres, approximately 30 feet are degraded herbaceous wetlands (3.6 acres per mile of roadway or 921 acres). Approximately 40 feet are typically pine, cabbage palm or exotic vegetation which invaded areas adjacent to roadways post-drainage (4.8 acres per mile of roadway or 1,228 acres). These areas are expected to be restored to pre-development vegetation condition.
5. Canal Plugs/Swale Blocks. The canals within the SGGE Restoration Project area are the major drainage features affecting the hydrology and ecology of the project area, due to their ability to intercept the surface water table aquifer. Canal plugs would eliminate channelized flow south of I-75. Mild slopes of the plugs will provide stability when surface water overtops the plugs during wet periods. Additional plugs would be placed in the swales (ditches) adjacent to some roads. There are 48 miles of canals in the SGGE Restoration Project with a typical width of 100 feet. Canal depth and submerged aquatic vegetation coverage vary, and the location and size of the canal plugs are very preliminary. There is limited information available to estimate habitat effects to aquatic species within the canals. At present there is no information available on the location or size of ditch plugs adjacent to some roads. The canal littoral zone is very narrow and subject to extreme water level fluctuation which limits productivity. Canals include some submerged aquatic vegetation which is subject to weed control activities.

6. **Canal Backfill.** Material from the existing roads would be used to fill canals to adjacent ground levels. The approach would be more effective than canal plugs in eliminating channelized flow and interception of ground water but would require extensive fill material. There are 48 miles of canals with a typical width of 100 feet. Canal depth and submerged aquatic vegetation coverage vary, and the location and size of the canal plugs are very preliminary. There is limited information available to estimate habitat effects to aquatic species within the canals, but if the entire canal system was considered to have some value, then 582 acres of habitat would be potentially effected if the entire project canal system was filled. There is no information available on the location or size of ditch plugs adjacent to some roads. The canal littoral zone is very narrow and subject to extreme water level fluctuation which limits productivity. Canals include some submerged aquatic vegetation which is subject to weed control activities.
7. **Elimination of Canal Maintenance South of the Spreader Channels and Removal of Existing Weir Structures.** Elimination of ongoing aquatic weed control activities for canal maintenance in major canals would restrict the conveyance capacity of the remnant canals and help reduce channelized flow. Since the canals south of I-75 would cease to act like canals, weir structures would become obsolete. Five internal weirs would remain unaffected, although concreted and sheet pile sections of these structures could be left intact if they created no environmental problems.
8. **Gated Culverts.** Culverts would divert some of the existing flow from canals to the spreader channel. Impacts to wetlands and other vegetation associated with these features would be negligible.
9. **Exotic Plant Removal.** Brazilian pepper and other exotics will be removed from berms and portions of roads that are degraded. Removal will include mechanical and herbicide applications. The exact acres of exotic plant removal is unavailable but is predicted to be 3,075 acres based on removal of a 100-foot-wide belt of exotic vegetation along 254 miles of roadway.
10. **Adjustable Weirs.** Adjustable weirs would be constructed in the canals. Obermeyer gate systems are proposed. The Obermeyer Spillway Gate system is a bottom-hinged spillway gate panel, lifted and supported on the downstream side by an inflatable air bladder. By controlling the pressure in the bladder, the gate can be infinitely adjusted within the system control range of full inflation to full deflation. This system can be remotely controlled and includes an air compressor, receiver tank, and various control valves for venting of air from the air bladder. All automatic systems include provision for local manual control. These structures would be held in the upright (closed) position most of the year, so that they would retain water within the canals. They would be opened during large storms to enable the large flows of water from Northern Golden Gate Estates to move southward to maintain existing flood protection conditions. There are no additional impacts to habitat associated with the construction of these weirs.

11. Berms along Canals. These berms would be earthen walls constructed parallel to canals to prevent sheetflow from returning to the canal. No plan is available to estimate the size and location of potential berms. Since there are existing berms along the canals, no additional effect to habitat is anticipated.
12. Lining of Canals. Placing a low permeability liner within canals or sections of canals would reduce the infiltration of groundwater into the canal.
13. Berm between SGGE and Belle Meade. The north-south berm would serve to prevent increased water levels and duration from extending onto private lands within the Belle Meade area. The dimensions and location of this berm are still under investigation. A very preliminary plan indicates this berm may effect 80 acres of habitat (62,000 by 56-foot berm) unless it is constructed within the Miller Boulevard right-of-way. No information is available to estimate the type of habitat loss associated with this berm, so we have assumed a worst case scenario of 80 acres for each species potentially affected.
14. Modify I-75 Bridges. Water in the Miller, Faka Union, and Merritt canals flows from Northern Golden Gate Estates under the I-75 bridges, and into SGGE. Initial modeling suggested that the bridges may be restricting water flow during storm events. Increasing the bridge size would allow water in Northern Golden Gate Estates to be lower or leave faster than under existing conditions and counteract the effect of other management measures which might cause flood waters in Northern Golden Gate Estates to be higher or stay longer than under existing conditions.

Effects of other restoration projects

A portion of the Tamiami Trail Culverts Critical Restoration Project is located south of the SGGE Hydrologic Restoration Project and is an essential element in restoration of sheetflow conditions from the project to the downstream estuary. The total project will involve installation of 54 culverts along Tamiami Trail (U.S. 41); construction of 21 new Tamiami Canal plugs, and modification of eight existing canal plugs. The existing bridges along the Tamiami Trail are too few in number and inadequately spaced to allow sheetflow conditions south of the Trail. The Tamiami Canal, on the north side of the Tamiami Trail, intercepts sheetflow and diverts this flow to the existing bridges. Plugs and/or driveways across the Tamiami Canal also restrict and divert flows. Typically the existing bridges provide more than historic flow at bridge locations, while areas between the bridges receive no surface water flow. The western portion of the Tamiami Trail, south of the SGGE project, impedes the north-south flow of surface water from wet prairies and cypress strands north of Tamiami Trail to saltwater wetlands; including brackish and salt marshes, mangroves, and open bays south of Tamiami Trail. The alteration of freshwater flow has resulted in saltwater encroachment further north than historic conditions, altering plant communities and ecosystem function. Restoration of this flow should restore wetlands to pre-development condition.

SGGE Restoration Project Status

A *Preliminary Draft Integrated PIR and Environmental Impact Statement*, dated January 2003, has been developed and is being revised. The preferred alternative based on this document is 3D. After an issues resolution conference on May 14, 2003, Corps Headquarters indicated that an Alternative Formulation Briefing guidance memorandum would be prepared to allow release of the PIR and Environmental Impact Statement provided that policy review comments were satisfactorily addressed. Project managers and the PDT modified answers to the policy review comments in mid-July 2003. New and old alternatives are being developed and modeled using an updated MIKE-SHE hydrological model. An important factor in SGGE Restoration Project design is the receipt of topographic information for the project in August 2003. After model results are available, ecosystem benefits of various alternatives must be re-evaluated. Agency working group and PDT meetings to address consensus on a recommended plan were held in August through September 2003. A Phase I/II Contaminants Environmental Site Assessment Report has been submitted to the District and the Service by URS Corporation. The District has proceeded with an early start project which will backfill Prairie Canal on the eastern portion of the project. The District may also proceed with the construction of the portion of Tamiami Trail Culverts south of the SGGE Restoration Project as an early start project. A draft PIR/EIS is projected to be released in December 2003 with a final document in March 2004 to meet deadlines for including the project in the Water Resources Development Act of 2004.

Land use and habitat types

Table 30-1 provides a list of the major land use, habitat types (1995 FLUCCS codes), habitat acres and percentage of total habitat acres in the project area for pre-development and 1995 (existing) conditions, as provided in the January 2003 Draft Integrated PIR and Environmental Impact Statement. Table 30-1 also indicates the anticipated changes in land use and major habitat types that will occur under Alternative 3D post-restoration.

Table 30-1. Acres, percent, and change for major plant communities in the Southern Golden Gates Estates Restoration Project analysis area for three time periods: 1940 pre-development target, 1995 existing conditions, and projected with implementation of Alternative 3D. Columns 1 through 3 represent acres and percent in analysis area for three time periods. Columns 4 through 6 represents change in acres and percent in analysis area between time periods identified.

FLUCCS Code	Ecological Community	1940 Pre-development		1995 Existing		Alternative 3D Implementation		Change 1940 to 1995		Change 1995 to 3D		Change 1940 to 3D	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
411	Mesic Flatwoods	9,711	15	14,822	23	16,271	26	5,111	53	1,449	15	6,560	68
625	Hydric Flatwoods	10,124	16	23,427	37	12,190	19	13,313	31	-11,247	-11	2,066	20
643	Wet Prairie	17,097	27	8,945	14	20,093	32	-8,152	-53	11,148	65	2,996	12
621/641	Cypress/Marsh	26,188	41	13,759	22	14,721	23	-12,429	-47	962	3	-11,467	-44
	Open Water	155	0	2,337	4	0	0	2,182	1,400	-2,337	-1,500	-155	-100
Analysis Area TOTALS		63,275	100	63,300	100	63,275	100						

Footprint of SGGE Restoration Project features

Eighty-three canal plugs would be placed in the four major project canals under Alternative 3D. The approximate locations of the plugs are shown in Figure 30-2. The source material for the plugs and swale blocks would be the spoil from the original canal and swale excavations and the demolition and degradation of the project roads. Source material from project roads that contains asphalt or other contaminants will not be used for fill and will be transported off-site or used in project roadways. The effects associated with the pump stations, road access for pump maintenance, and powerline construction include the construction of about 4 miles of new roads and should be sited in areas that have existing impacts or are not proposed for wetland restoration. A flood control levee is proposed to be constructed along Miller Boulevard on the western project extent. The Preliminary Draft PIR/EIS indicates that this levee would be 62,000 feet in length and be 12 foot wide, 6 feet high, with 3:1 side slopes, which is approximately 180 square feet in cross sectional area. The amount of fill required for this berm construction would be 165,000 cubic yards. The berm is designed to prevent additional overland flow to offsite private property in order to maintain the existing level of flood protection. Subsequent to development of the Preliminary Draft PIR/EIS, significant consideration of the necessity of berm construction, and berm cost, features, size, and location occurred. This project feature has the

Alternative 3D- Most Roads Removed and Northern Spreader

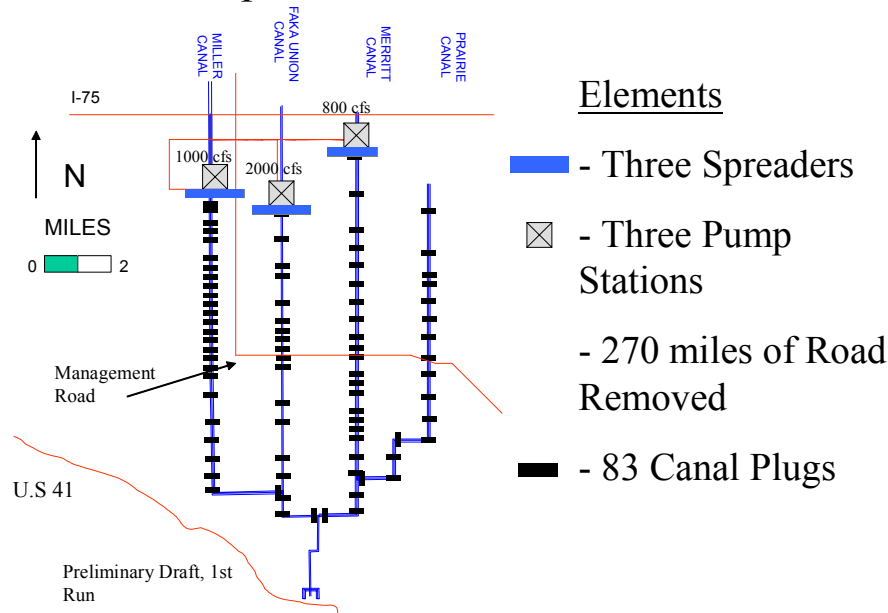


Figure 30-2. Location of project features under Alternative 3D of the South Golden Gate Estates Restoration Project (Corps 2002g).

potential to affect wetlands within Figure 30-2. Eighty-three canal plugs will be placed in the four major project canals using spoil from the original canal and swale excavations and the demolition and degradation of the project roads. The project boundary and downstream transport of surface water to a major receiving flowway to the southwest (within the Belle Meade portion of Picayune Strand State Forest, Collier Seminole State Park and the Ten Thousand Islands). Approximately 259 of the 279 miles of roads existing in the SGGE Restoration Project would be demolished. The roads and adjacent swales would be removed with heavy equipment, and the trees and other vegetation located adjacent to the roadway would be left in place as much as practicable. Demolished roads and swales would be reduced to adjacent ground elevation and would be generally impassable by vehicles with the exception of those roadways which may be stabilized at ground level for management purposes. Approximately 20 miles of existing road would remain in SGGE. Stewart Boulevard would remain to connect Janes Scenic Parkway and Everglades Boulevard to the I-75 overpass to Northern Golden Gate Estates, Berson Boulevard west of the Merritt Canal would remain, and a portion of Miller Boulevard would remain within the northwest project boundary. These roads would be modified with low water crossings and culverts to allow water to flow over and under them. The extent to which Miller Boulevard remains accessible or is stabilized may effect wetland restoration, fish and wildlife resources, and listed species.

Operational Features

Water Control and Operations and Maintenance Manuals will be prepared and interim operations and maintenance will be defined as the project proceeds. The District will operate and maintain the pump stations and other project infrastructure. The specific operation of pump stations and other water control structures during storm events, seasonal high water discharges and the dry season may further affect wetland restoration, fish and wildlife resources and listed species. The Florida Division of Forestry will manage the SGGE land as a unit of the Picayune Strand State Forest. The Division of Forestry is currently operating the forest under an existing 5-year plan coordinated with the Department of the Interior and DEP. After the SGGE restoration plan is authorized, the Division of Forestry's management plan will be updated to reflect the project plan and operation. The plan is subject to ESA Section 7 consultation under the FB3 agreement with regard to Department of Interior funding of project acquisition, and may be subject to review under other sections of the ESA.

Anticipated Habitat Changes

The primary goals of the SGGE Restoration Project are to restore short- and long-hydroperiod wetlands to historic proportions by inducing sheetflow conditions and reducing point-source discharges of freshwater to restore downstream estuaries. Table 30-1 indicates the anticipated habitat changes based on hydroperiods associated with the major existing wetland communities in southwest Florida. Only major plant communities are identified in Table 30-1, although 24 different plant communities and land use categories have been mapped for purposes of identifying the effects of drainage on the landscape between pre-development (1940's) and 1995. The major effects of the drainage associated with the existing canal and water management

infrastructure within the project are the loss of cypress forest and herbaceous wet prairies. Historically, small areas of pine flatwoods normally designated as uplands were located in narrow strands in elevated areas of the project and in the northwest project corner. Hydric flatwoods, which often had water at or above the ground surface for at least short periods during wetter portions of the year constituted the majority of the remaining flatwoods. Due to the variable nature of shallow wetland hydroperiods and site topography over time, many on-site plant communities historically contained elements of both uplands and wetlands which were periodically affected by fire, freeze, drought, flood, and hurricane events. After drainage, upland pines, cabbage palms, and hardwoods invaded many of the cypress forests. Severe and frequent fires eliminated many of the pine and cypress trees, furthering the conversion of these lands to earlier shrubby successional states of upland or shallow wetland plant communities. Exotic plant species, particularly Brazilian pepper, have changed the character of many habitats, especially adjacent to the site's extensive canal and roadway network. Because the site is significantly affected by drainage features upstream of the project, primarily Northern Golden Gate Estates the project goals were developed with acknowledgment that habitat restoration would include a balance of project management features to restore as much of the site as possible to pre-drainage character. There was also consideration of upland restoration and protection, acknowledgment of interim and post-restoration management, and post-restoration operational features related to the effects of the project on fish and wildlife and listed species concerns.

Table 30-1 indicates that the model results based on the preferred alternative will result in more mesic flatwoods (6,560 acres) and greater proportions (on the order of 2,000 to 3,000 acres) of hydric flatwoods and wet prairie than pre-drainage conditions. These plant communities would replace 11,467 acres of pre-drainage cypress forest and some freshwater marsh. Although exact figures are not available based on the lack of an estuarine model, changes in estuarine communities between 1940 and 1995 indicate that the reduction of freshwater flows to the estuary may have increased the extent of mangroves south of the project boundary by approximately 1,853 acres and decreased brackish marshes by 2,094 acres. While Alternative 3D might appear to be lacking in restoring cypress forests on the project site to pre-drainage conditions, the following should be considered when assessing the project restoration benefits: (1) pre-development cypress communities often (based on analysis of soils maps) included mixed canopies of pines, palms and hardwoods, especially in shorter-hydroperiod cypress forests as opposed to deeper cypress stands, therefore there may be an over-estimate of the original extent of cypress forest; (2) project design considerations purposely included protection of upland plant communities in the northern and northwest project boundaries to minimize downstream project effects to listed species such as the panther and red-cockaded woodpecker, and rare plant communities such as tropical hammocks; and (3) significant restoration of the quality and function of 14,721 acres of cypress forest from the existing condition is anticipated under Alternative 3D.

Initial effects analysis for the Southern Golden Gate Estates Hydrologic Restoration Project

Florida Natural Area Inventory surveys (FNAI 2001) indicate that no federally listed plant species were documented on the SGGE Restoration Project site.

Fourteen federally listed animal species are present or potentially present in the project area. These are the endangered Florida panther, West Indian manatee, red-cockaded woodpecker, wood stork, American crocodile, Everglades snail kite, Kemp's ridley sea turtle, Atlantic green sea turtle, hawksbill sea turtle, and leatherback sea turtle and the threatened piping plover, Eastern indigo snake, bald eagle and loggerhead sea turtle.

Fish species proposed for listing and candidate fish species regulated by the NOAA-Fisheries which are or may be in the project area include the proposed for endangered listing Smalltooth Sawfish and the candidate Goliath grouper, Mangrove rivulus, and Sand tiger shark

West Indian Manatee

Manatees have been year-round residents in Collier County since at least 1930 (Hartman 1974; Beeler and O'Shea 1985). Aerial surveys conducted in the mid-1970's through the early 1980's documented manatee distribution throughout the region, particularly in the Faka Union Canal (Beeler and O'Shea 1985). It is likely that manatees used the Faka Union River before the canal was dredged in the mid -1960's.

One hundred seventeen water-craft-related manatee deaths were documented from Collier County from October 1979 through July 2003. Documented deaths from January 1985 through March 2001 have been most concentrated in Naples, Marco Island, and the Port of the Islands/Faka Union Canal, with substantial numbers also occurring near Cape Romano, and in Chokoloskee Bay, the Barron River, and Tamiami Canal. Carcasses were also recovered in the Blackwater River, Halfway Creek, Turner River, and Lopez River. As late as June 7, 2003, a watercraft-related death of a manatee occurred in Faka Union Canal downstream of the SGGE Restoration Project.

The Port of the Islands Marina basin, located within the Faka Union Canal system directly south of the last weir structure and including areas underneath and slightly north of U.S. 41, is the second largest manatee warm water refugia in southwest Florida (behind the Florida Power and Light power plant within the Caloosahatchee River in Lee County). This marina basin can support up to 300 manatees during periods of cold stress. The marina depth is probably responsible for offering what has been referred to as a "passive" warm water refugia.

As part of their research contribution to the CERP, the U.S. Geological Survey (USGS 2000) initiated a study on the effects of hydrological restoration on manatees in the Ten Thousand Islands region in June 2000. The major objectives of the study are to determine distribution, movements, and habitat use of manatees associated with coastal waters and rivers, and to

develop a population-level model to predict manatee response to changes in hydrology achieved by the SGGE Restoration Project specifically, and more broadly by the CERP. Surveys were conducted through July 2001 using strip-transect aerial surveys, satellite telemetry, and tracking of two individuals using a specially-designed Global Positioning System (GPS) tag. In addition, preliminary spatial analysis of radio tracking and GPS data were used with ArcView software to show potential changes in habitat use patterns associated with changes in availability of fresh water. These data provide the basis for the first detailed analysis of manatee use patterns in the Ten Thousand Islands/ENP area.

Strip-Transect Aerial Surveys. This approach has been used successfully to estimate manatee abundance in the Banana River, Florida (Miller et al. 1998). Estimated population densities ranged from 112 to 209 in the 167-km² study area.

Radio-tracking study. The radio-tracking study provides data critical for documenting the pre-restoration use of habitat by manatees within the region affected by the SGGE restoration. The GPS tag acquires locations every 15-30 minutes which are much more accurate than the radio-tracking data (approx. 30 m vs. 150 m or more), but the battery life expectancy is much shorter (8 weeks vs. 7 months). In combination, the radio-tracking data provides region-wide, long-term coverage suitable for revealing general patterns of habitat use, while the GPS data shows fine details of travel pathways and time spent in specific areas. A preliminary analysis of the radio tracking data indicates that manatees in this region alter their movement patterns and habitat use in response to seasonal changes in temperature. During the cold-season of 2001, the majority of the telemetry locations were in the Faka Union canal, inland rivers, or inshore bays, suggesting that these areas provide important thermal refugia to manatees. In comparison, during the warm season, manatees are distributed across a much broader region, and the majority of the telemetry locations occur in offshore areas where the prime seagrass beds are found.

A preliminary analysis of the GPS data suggests some important habitat requirements for manatees occur in this region. GPS data for two manatees shows both animals making large movements (tens of kilometers) to and from the Faka Union canal to forage on seagrass beds in offshore areas. These animals show a pattern which may be typical for many manatees in this region: multiple days of feeding on offshore seagrass beds followed by rapid, directed movement to a distant source of freshwater. Following a brief residence time at this freshwater site (often only a few hours), a rapid, directed movement is made back out to offshore areas. These large movements suggest that the availability of freshwater is an important determinant of manatee distribution and abundance in this region.

The striking difference in seasonal (February vs. July) use of the Faka Union canal by radio-tagged manatees is undoubtedly related in large part to the warmer water temperatures in July. However, the increased availability of freshwater in surrounding rivers and creeks may also be important. Depending upon the relative availability of freshwater in the canal vs. neighboring waterways after restoration, manatee use of the canal may be even further reduced.

Manatee Critical Habitat

Manatee critical habitat was designated in the early 1970's, although no specific primary or secondary constituent elements were included in the designation (50 CFR 17.95). Estuarine portions of the project area are within the designation and have features essential to the conservation of the manatee, including warm water refugia and preferred foraging habitat (seagrass beds) adjacent to relatively deeper waters with little boat traffic.

Seagrasses are the predominant food of the manatee in coastal areas. Inland bays of the Ten Thousand Islands are generally characterized as “muddy” bays. Approximately 52 percent of Fakahatchee Bay east of the SGGE Restoration Project and 76 percent of Faka Union Bay directly downstream of the project has a mud bottom. In those bays most directly affected by the project, green filamentous algae constitutes the major standing crop biomass during winter (dry season) months, with seagrasses and red-macro algae present in sparser amounts. During the summer (wet season) months, seagrasses increased dramatically in the more pristine estuary of Fakahatchee Bay west of the project, while algae, particularly red macro-algae, continued to predominate in the impacted Faka Union Bay (Carter et al. 1973).

Red-Cockaded Woodpecker

The red-cockaded woodpecker population in lower peninsula Florida from Orlando south is limited to about 244 occupied clusters (DeLotelle 2000). In 1992, approximately 25 occupied, 10 undetermined, and 11 abandoned clusters occurred in the east Naples area including the Belle Meade tract of Picayune Strand State Forest adjacent to SGGE. Although South Florida does not include a designated federal recovery population for red-cockaded woodpeckers, it does contain significant support-populations. State-wide protection and restoration efforts focus on acquiring, managing, and restoring habitat surrounding these populations. Lands identified for acquisition should be contiguous with publicly-owned conservation lands that contain red-cockaded woodpecker clusters (Beever and Dryden 1992).

The Belle Meade tract of Picayune Strand State Forest comprises approximately 14,460 acres. In combination with the 63,275-acre SGGE Restoration Project, the project area provides an opportunity to support between 20 and 30 groups of red-cockaded woodpeckers, assuming population expansion techniques and exotic plant species control is successful (DeLotelle and Guthrie 2000). The Belle Meade population of red-cockaded woodpecker's includes 4 occupied and 11 abandoned clusters, located in mesic and hydric pine flatwoods. Approximately 40 red-cockaded woodpecker clusters are located 15 miles east of the SGGE Restoration Project in the BCNP.

Florida Panther

The Picayune Strand State Forest, Fakahatchee Strand State Preserve, Florida Panther National Wildlife Refuge, BCNP, the Big Cypress Seminole Indian Reservation and ranches located in southern Hendry County and northeastern Collier County provide a contiguous landscape that

supports the only extant breeding puma population east of the Mississippi River. The survival and recovery of the Florida panther is dependent on protection and enhancement of the extant population, associated habitats, and prey resources. Panthers require adequate cover for resting and denning sites, prey, and a relative lack of disturbance in terms of road hazards and human activity.

Figures 30-3 and 30-4 summarize telemetry data, gathered by the Service, from radio-instrumented panthers over the last two decades. These data indicate that the Fakahatchee Strand Refuge northeast of the project, and private lands northeast of the project are heavily used by panthers. Telemetry data for the Belle Meade portion of the Picayune Strand State Forest west of the SGGE Restoration Project area indicate panther use is concentrated in areas of higher-quality forested cypress and pine habitat. Telemetry data for the SGGE Restoration Project area indicate reduced occurrence, possibly consistent with degraded habitat and human disturbance associated with the 290-mile grid of primary and secondary roadways (Darryl Land, FWC, personal communication 2001).

The SGGE Restoration Project area is utilized primarily by sub-adult male panthers which disperse through the site to the Belle Meade portion of Picayune Strand State Forest from Fakahatchee Strand. The SGGE Restoration Project does not include any established home ranges for adult (breeding) female panthers (Darryl Land, FWC, personal communication 2001). However, breeding female panthers utilize the adjacent Fakahatchee Strand State Reserve east of the project. The lack of frequent home range vacancies makes the likelihood of male panther recruitment into the population low (Maehr 1990a). Females are readily recruited into the population as soon as they are capable of breeding (Maehr et al. 1991a). Males appear to have more difficulty being recruited. Without large areas of suitable habitat to accommodate dispersal, young males have few opportunities for recruitment as residents. As a result, the panther's ability to increase and outbreed has been severely restricted. Successful male recruitment appears to depend on the death or home range shift of a resident adult male (Maehr et al. 1991a).

White-tailed deer and wild hog are important prey items for the Florida panther throughout south Florida (Maehr et al. 1990). Deer and hog density information is not available for the immediate project area. Deer densities may be affected by habitat quality and human disturbance. Deer densities on over drained private lands northwest of the project area in an urbanizing area averaged 1 deer/591 acres (Turrell & Associates, Inc. 2001). Deer density in the Corn Dance Unit of BCNP east of the project were predicted to be one deer/165 acres to one deer/250 acres. Predictions of deer density in Fakahatchee Strand were estimated to be higher than one deer/18.2 acres (McCown 1991). Deer densities in the Mullet Slough area of BCNP yielded a estimated density range of one deer/93 acres and one deer/250 acres. The Stairsteps unit of the BCNP yielded densities of one deer/218 acres to one deer /190 acres using track count estimates. Aerial surveys for the same units used after 1982 estimated deer densities at one deer/60 acres to one deer/2643 acres. Harlow (1959) predicted deer density in wet prairie habitat in Florida to be one deer/115 acres.

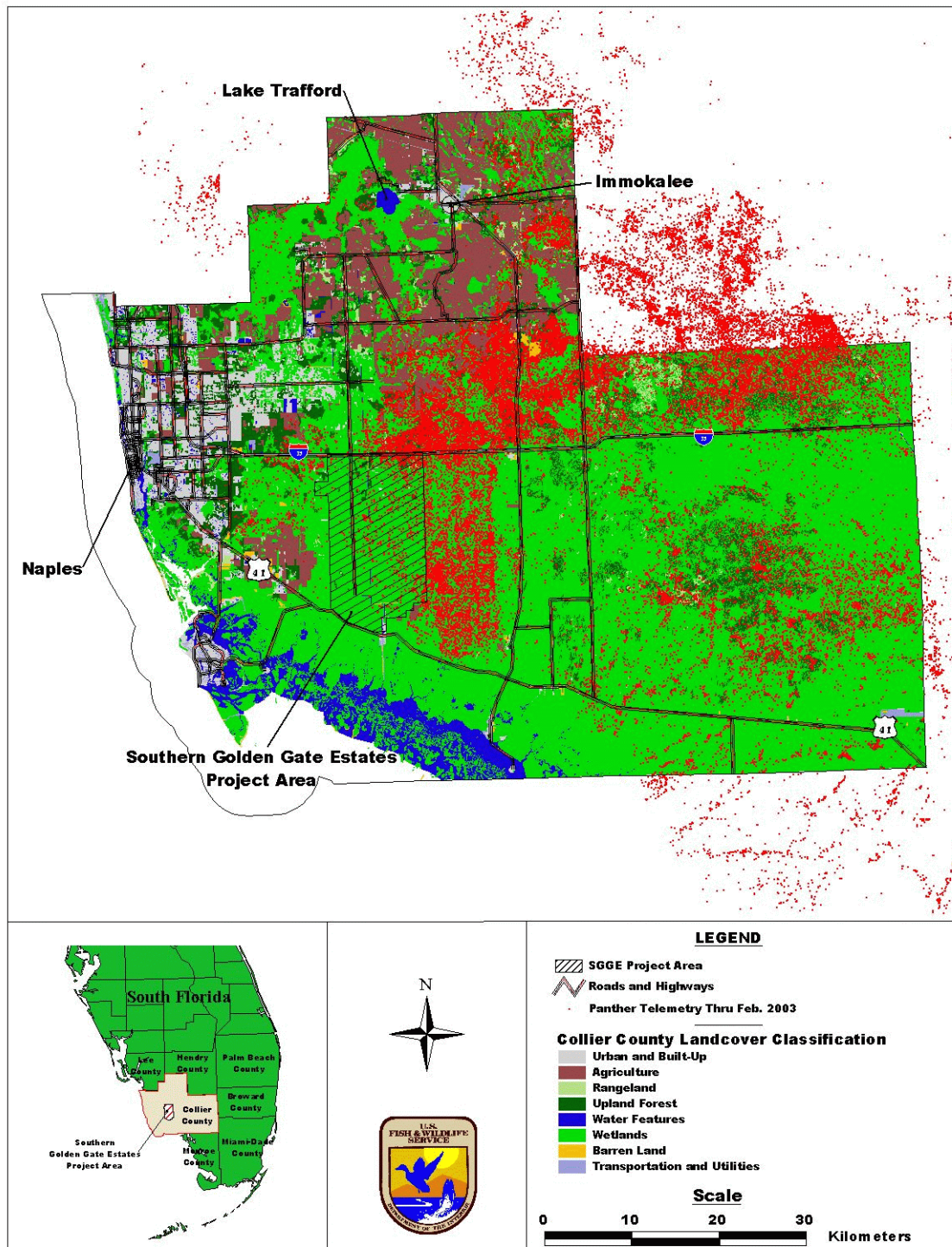


Figure 30-3. Summary of telemetry data gathered by the Service over the last two decades from radio-instrumented panthers in and around Collier County.

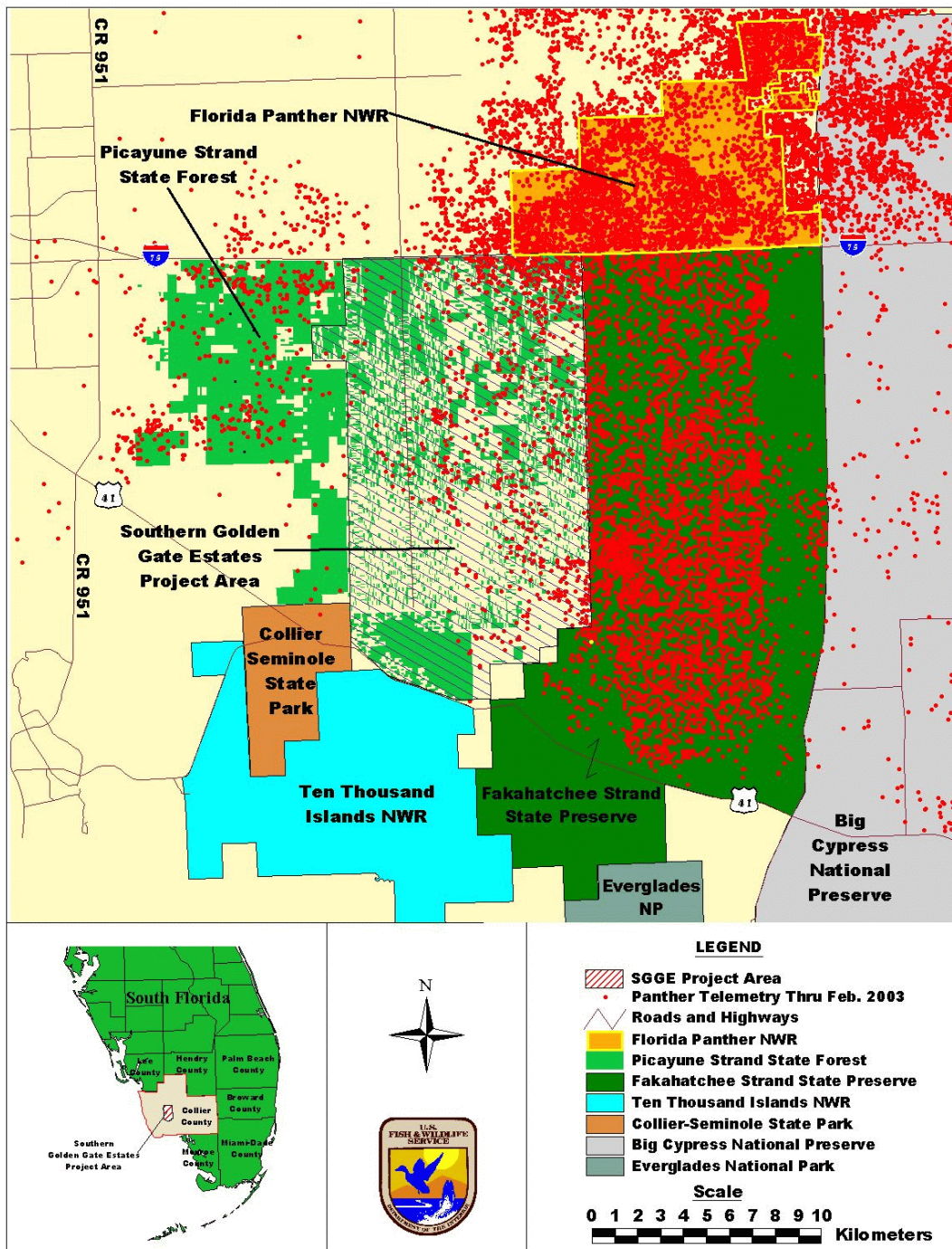


Figure 30-4. Telemetry data gathered by the Service from radio-instrumented panthers over the last two decades within and around the Southern Golden Gate Estates Restoration Project. Data for the project area indicate reduced occurrence, possibly consistent with degraded habitat and human disturbance associated with the 290 miles of primary and secondary roadways (Darryl Land, FWC, personal communication 2001).

Transportation infrastructure to accommodate increased agricultural and urban growth and the associated increase in traffic volume has resulted in significant threats to the panther. Collision with motor vehicles accounted for approximately 46.9 percent (n=15) of all documented panther mortality from December 1979 through May 1991 (Maehr et al. 1991b). Since 1972, 44 panthers have been killed by vehicles, primarily in Collier and Hendry Counties in southwest Florida. Thirty-four panthers have been killed by vehicles since 1985 (FWC 2001). Vehicle-related mortality is the most often documented source of human-related mortality (Maehr 1989, Maehr et al. 1991b).

Although road mortality is a concern, habitat loss, habitat fragmentation, and increased human access in south Florida are greater threats to the panther. In addition to habitat degradation from over drainage and wildfire, the SGGE area has been subject to uncontrolled human access primarily related to off-road vehicle use and hunting since subdivision construction in the 1960's. Continued development associated with the expansion of Florida's urbanized east coast, increasing growth on the west coast, and the spread of agricultural development in the south Florida interior have placed increasing pressure on panthers and panther habitat (Maehr et al. 1991a, Maehr 1992b). Rapid development in southwest Florida is compromising the ability of natural habitats to support a self-sustaining panther population (Maehr 1990b, 1992b). Maehr (1990a) reports that there are approximately 2.2 million acres of occupied panther range in south Florida and that approximately 50 percent of the known breeding distribution is comprised of landscapes under private ownership. Maehr (1990a) indicates that unchecked development of private lands will limit panther habitat to landscapes under public stewardship and result in extinction of the panther. Maehr (1990b) also reports a lack of unoccupied, suitable habitat for subadult dispersal. This suggests that available landscapes are at or near carrying capacity under existing habitat conditions.

Because of their wide-ranging movements and extensive spatial requirements, panthers are particularly sensitive to habitat fragmentation (Harris 1985). Past land use activity, hydrologic alterations, road construction, invasion of exotic plants, and lack of fire management have affected the quality and quantity of panther habitat.

Everglade Snail Kite

Snail kites have not been documented within the project boundaries, however, no specific surveys have been conducted for this species in the project area. Snail kites are present in wetlands within the Lostman's and Okaloacoochee sloughs, Hinson Marsh, and the East Loop and Corn Dance units of BCNP east of the project site (Service 2000b). A snail kite was observed by Service staff foraging in ditches adjacent to U.S. 41, approximately 6 miles northwest of the project site in 2002.

Everglades Snail Kite Critical Habitat

The SGGE Restoration Project does not include designated critical habitat of the Everglade snail kite.

Wood Stork

The wood stork is known to forage within suitable wetland habitats located throughout the project area. Suitable wood stork foraging habitat consists of shallow wetlands with water depths of 2 to 15 inches. From January through June of 2001 the Corps conducted monthly aerial wading bird surveys of the SGGE Restoration Project site and surrounding public and private lands. These surveys indicated that wading bird numbers were generally very low during all months. Almost no surface water or wading birds were observed within the project area. The only water present in SGGE could be found in canals with steep banks and deep water making these areas inaccessible to foraging wading birds. Drought conditions may have been a contributing factor to the low number of birds recorded. However, because of excessive drainage by the SGGE canal network, these conditions are probably not that far removed from a normal dry season. Only 27 wood storks were sighted during 6 survey flights (Nelson et al. 2001).

Three active nesting colonies are known to occur near the project area. Two of these colonies are located at Audubon's Corkscrew Swamp Sanctuary within the Corkscrew Regional Ecosystem Watershed, northeast of the project site. The third wood stork nesting colony is located east of the project site just north of the Fakahatchee Strand State Preserve. During the breeding season, feeding areas near the Corkscrew colony play an important role in chick survival and provide enhanced opportunities for newly fledged birds to learn effective feeding skills. Wetlands within 18.6 miles of rookery sites have been described as CFAs for wood storks (Cox et al. 1994). Wood stork nest surveys have been conducted within these nesting colonies by the State of Florida. Data for the two colonies located in the Corkscrew Regional Ecosystem Watershed indicate that 1,722 nests were constructed in 2000 and 1,240 nests were reported in 2002. No data was available for 2001. Additional data collected by the National Audubon Society indicate that 2,538 wood storks fledged during 2000 and 3,160 fledged during 2002. Again, no data was reported for 2001. The most recent nesting data for the nesting colony located north of the Fakahatchee Strand State Preserve indicate that 50 nests were observed during 1999 and 25 nests during 2000. No data is available for 2001 or 2002. Historic nesting data was unavailable for the nesting colony located north of the Fakahatchee Strand State Preserve, however, nesting and fledgling data has been collected within Corkscrew Swamp Sanctuary since 1958. The largest historical wood stork colony in the United States is located at Audubon's Corkscrew Swamp Sanctuary. On average over the last 44 years, 1,654 nests have been initiated yearly, producing an average of 2,161 fledged young, or 1.3 young fledged per nest. However, the 44-year average is somewhat misleading. Prior to 1968, as many as 5,000 wood stork nests were initiated annually. Nesting activity peaked in 1961 when 6,000 nests produced a record 17,000 young fledged, or 2.8 fledged young per nest. The production of wood stork colonies varies considerably between years and locations, apparently in response to differences in food availability. Colonies that are limited by food resources may fledge an

average of 0.5 to 1.0 young per active nest; colonies that are not limited by food resources may fledge between 2.0 and 3.0 young per active nest (Ogden 1996). The 44-year average indicates that, at least for the two colonies at Corkscrew, these colonies are generally limited by food resources. During the year 2002, these colonies were not limited by food resources. No data on nest productivity is available for the colony north of Fakahatchee Strand State Preserve. However, based on the overlapping CFAs, it is likely that these birds face many of the same foraging conditions as those nesting within Corkscrew Swamp Sanctuary.

Development pressures due to ongoing population growth in Collier and Lee County continue to threaten wetlands in the action area. Data from the U. S. Census Bureau indicate that from 1968 to 2000 the populations of Collier, Hendry, and Lee Counties have increased by 94, 78, and 88 percent, respectively. The population of this three-county area was estimated at 731,675 during the 2000 census, and is expected to continue to grow, with a concomitant increase in the filling of wetlands due to development.

An analysis of information in the Service's GIS database indicates that the CFA around the National Audubon Society's Corkscrew Swamp Sanctuary wood stork colonies is about 695,593 acres in size and comprises 58 percent uplands and 42 percent wetlands. Twenty-one percent of the CFA wetlands are located on public lands and the remaining 79 percent are located on private lands. The northern portion of the SGGE Restoration Project is located in this CFA.

Wetland alteration on private lands, although regulated, is common in the action area. The Service's GIS analysis of National Wetlands Inventory data indicates that the function of 31,969 acres of wetlands in the CFA of the Corkscrew Sanctuary nesting colonies has been diminished by ditching and draining, excavation, and impoundment (11 percent of total wetlands). Another 24,272 acres have been lost to development (8 percent of total wetlands). It is important to note that although many wetlands remain unaltered, changes in land use patterns around these wetlands have isolated them from larger systems and diminished their value to forage fish and wood storks.

Canals are common in the action area and significantly influence the hydrology of wetlands and other surface waters important to wood storks. Numerous studies have documented the environmental effects of canals. Wang (1983) conducted a study in southwest Florida and found that the water table in the study area dropped about 1.5 to 2 feet after construction of canals. Another southwest Florida study found that the water table dropped about 2 feet as far as 6,000 feet from the canal (Swayze and McPherson 1977). Black et al. (1974) estimated that, after construction of the canals, annual runoff from SGGE increased significantly.

Bald Eagle

Bald eagle use varies in the SGGE Restoration Project area but is primarily confined to foraging activities. Bald eagle nests in Collier County are located within 10 miles of coastal estuaries, although most are located within 2 miles. No bald eagle nests are located in the SGGE Restoration Project area although one nest is located approximately 5 miles west of the project site in the Belle Meade tract of Picayune Strand State Forest. Bald eagles in Collier County typically nest in pine trees, but are also known to nest in cypress.

Eastern Indigo Snake

The eastern indigo snake is a large, black, non-venomous snake which is widely distributed throughout South Florida. Dramatic population declines have been caused by over-collecting for the domestic and international pet trade as well as mortality caused by rattlesnake collectors who gassed gopher tortoise burrows to collect snakes. Habitat loss and fragmentation by residential and commercial expansion are more significant threats to the eastern indigo snake in southwest Florida.

Because of its relatively large home range, this snake is especially vulnerable to habitat loss, degradation, and fragmentation (Lawler 1977, Moler 1985b). Lawler (1977) noted that eastern indigo snake habitat has been destroyed by residential and commercial construction, agriculture, and timbering. Extensive tracts of wild land are the most important refuge for large numbers of eastern indigo snakes (Diemer and Speake 1981, Moler 1985b). Additional human population growth will increase the risk of direct mortality of the eastern indigo snake from property owners, domestic animals, and highway mortality.

The eastern indigo snake is present within project boundaries and on adjacent private and public lands in the region. The SGGE Restoration Project area, along with Northern Golden Gate Estates, is known to be a popular collection site for amphibians and reptiles due to the accessibility associated with the sub-tropical environment and the grid of 290 miles of roadway (Lennie Jones, Florida Panther and Ten Thousand Islands National Wildlife Refuges, personal communication 1997). No specific survey data is available for the project area.

American Crocodile

The current distribution of the American crocodile is limited to extreme South Florida, including coastal areas of Collier and Lee Counties. The distribution of crocodiles during the non-nesting season may vary considerably among years since adult crocodiles can disperse great distances (Kushland and Mazzotti 1989). The majority of crocodiles are present in the vicinity of core nesting areas, located near Biscayne and Florida bays (Kushlan and Mazzotti 1989). Successful crocodile reproduction has not been documented in the Ten Thousand Islands or on the southwest Florida coast. Along Florida's southwest coast, several small groups and individual crocodiles have been documented from Sanibel Island and Pine Islands, Lee County, south to the Fakahatchee River, Collier County. Crocodiles have been reported in Rookery Bay north of Marco Island and at the Eagle Creek Country Club just southwest of S.R. 951 and U.S. 41. A

crocodile was road-killed on U.S. 41 near the Faka Union Canal in 1997 (Lennie Jones, Florida Panther and Ten Thousand Islands National Wildlife Refuges, personal communication 1997). As many as 11 adult crocodiles have frequented manmade borrow pits at the Marco Airport site, approximately 9.5 miles west of the SGGE Restoration Project. These crocodiles have repeatedly nested unsuccessfully on an adjacent elevated berm called the “Road to Nowhere.” Crocodiles have been reported in the Fakahatchee River southeast of the project site by National Park Service and DEP staff in 2002 and 2003.

American Crocodile Critical Habitat

The SGGE Restoration Project does not include designated American crocodile critical habitat.

Sea Turtles

Five species of federally listed sea turtles have the potential to be affected by the project. They are the Atlantic loggerhead turtle, Atlantic green turtle, leatherback turtle, Atlantic hawksbill turtle, and Atlantic ridley turtle. Swimming sea turtles are not under the jurisdiction of the Service, but are managed by the NOAA-Fisheries. This project is unlikely to adversely affect sea turtle nesting.

Estuarine Fishes

Four estuarine fish species under consideration for federal listing are or may occur in the downstream estuaries of the project: smalltooth sawfish, mangrove rivulus, Goliath grouper and sand tiger shark. These species are also under NOAA-Fisheries jurisdiction.

Project effects on federally listed species

West Indian Manatee

Freshwater is an extremely important resource for manatees throughout their range (Lefebvre et al. 2001), and the Ten Thousand Islands region is no exception. The projected reduction of average freshwater flows in the Faka Union Canal during the dry season (November-May) is likely to influence manatee use of the canal and therefore their distribution throughout the region. Manatees are known to shift their use of warm water sites in response to changes in warm-water discharges at powerplants along the Atlantic Coast. USGS biologists suspect that manatees will show some plasticity in their use of freshwater sites in this region in response to restoration efforts. USGS biologists hypothesize that during cold periods (water temperature < 20°C), manatees will continue to aggregate in the Port of the Islands Marina basin south of the SGGE Restoration Project, in part because of thermal buffering provided by the deeper water, as well as to drink fresh water seeping through the weir at the head of the canal. During warmer periods (water temperature >20°C), manatees will tend to disperse from the canal, particularly if adjacent rivers are receiving greater freshwater input than the canal.

Uncertainty exists with respect to this issue, and several years of field data must be collected before and after restoration to address this question. In the interim, a manatee model can be used to examine the range of responses that can be expected, given different assumptions about manatee behavior. As additional data is collected, the model can be refined to incorporate new insights provided by the survey and radio tracking data, and the response of manatees to natural environmental fluctuations and human-induced alterations.

Project alternatives will reduce dry season freshwater discharges in the Faka Union Canal and should restore watershed connections to the adjacent Blackwater, Pumpkin, and Fakahatchee (to a lesser degree) Bay estuaries. Restoration of the watershed may contribute to additional manatee use of these natural freshwater sources as opposed to the existing freshwater point source discharges from Faka Union Bay. Reduction of the point source freshwater discharge from Faka Union Canal is not anticipated to alter use of the marina basin at the discharge point as a manatee warm water refugia. A reduction of the point source discharge at Faka Union Bay and restoration of more natural flows to other adjacent estuaries may restore seagrasses within the project area, particularly within Faka Union Bay, although seagrass restoration may be a minor restoration benefit of this project. However, any increase in available forage habitat within Faka Union Bay, in proximity to the warm water refugia at the Port of the Islands Marina basin, could benefit manatees by decreasing cold stress and physiological demands associated with travel between warm water refugia and foraging habitats.

Because use of the Faka Union Canal brings manatees into close proximity with boats, it is possible that boat-related deaths and injuries in this region will be reduced if manatees become less reliant on the canal as their major source of freshwater. A change in manatee use of Faka Union Canal during periods of cold stress could also change exposure to boat traffic. The degree to which this is beneficial or adverse would depend on where manatees relocate within the Ten Thousand Islands estuary. A modeling effort outlined in the Conservation Recommendations may be useful in predicting manatee behavior. However, manatee experts believe that the attraction to the marina basin is associated with water temperatures due to marina depth, and so it is not anticipated that manatees will change their use of the warm water refugia as a result of the SGGE Restoration Project. The degree to which manatee behavior may change during periods when cold stress is not a determining factor in manatee movements should be further assessed to determine the potential for boat-related manatee injury or mortality. However, generally low levels of boat traffic in those bays predicted to receive additional freshwater flow as a result of the restoration may limit the adverse effects to manatees, especially when balanced with habitat restoration or potential for reduced manatee use of the more heavily traveled Faka Union Canal when cold stress is not a factor.

Because there is no estuarine model that can quantify changes in flow to individual downstream estuaries, an evaluation of proposed alternatives can only be made based on estimating point source discharge reductions over existing conditions. Therefore, if Alternative 3D was anticipated to reduce flows through Faka Union Canal by 75%, then it could be theorized that Alternative 3D is offering 75% restoration benefits over the existing condition. Alternatives could only be evaluated compared to existing conditions. However, some minimal flow and seasonal fluctuation should be maintained from Faka Union canal to maintain the health of the

downstream estuary. This additional flow could be considered an additional benefit, as dry season flows are limited under existing conditions. If flows were increased during periods of cold stress for manatees, an analysis of potential changes in temperature in the marina basin would have to be conducted to determine effects on the warm water refugia. Construction activities are not anticipated within the Port of the Islands Marina Basin or in Faka Union Canal north of U.S. 41, therefore, no harm/harassment from construction is expected.

Manatee Critical Habitat

The effects of the SGGE Restoration Project on the extensive seagrass beds located in the outer edges of the estuary cannot be specified due to lack of information necessary to model estuarine processes. However, restoration of more natural flows to the estuary should change the ecosystem toward pre-development conditions and improve marine resources. As discussed above, alternatives could then be compared to existing conditions.

Red-Cockaded Woodpecker

Table 30-1 describes project habitat changes after restoration and shows the occurrence of 7,177 acres more potential red-cockaded woodpecker habitat (mesic and hydric pine) than existed during pre-development. However, Table 30-1 also indicates that 9,798 acres of existing (1995) potential red-cockaded woodpecker habitat will be lost as a result of restoration activities. These figures would appear to indicate that a loss of available red-cockaded woodpecker habitat would occur following restoration. However, an analysis of acres fails to consider the importance of restoring a landscape to unfragmented habitat. Increasing the quality of the available habitat through restoration and management are an important part of this effect determination. These and other issues are summarized as follows:

1. GIS vegetation predictions - habitat descriptions for the existing acres of mesic pine flatwoods/mesic hammock include areas of wetlands that have been invaded by cabbage palm and slash pine since 1940. A portion of this acreage is dominated by cabbage palm hammock or mesic flatwoods that are invaded by cabbage palms and other vegetation as a mid-story component. Evaluation of areas of cypress forest in the restoration area also indicate that hydric pine stands or mixed pine/cypress may be indicated as cypress by the GIS. Therefore, the estimates of existing mesic flatwoods appear to be inflated, making the loss of these flatwoods to the restoration proposal less significant. Conversely, available pine canopy may be indicated by the GIS as cypress, therefore underestimating the post-restoration pine canopy available for use by the red-cockaded woodpecker. Red-cockaded woodpeckers also forage in, but do not appear to prefer, cypress in south and central Florida (Roy DeLotelle, DeLotelle and Guthrie, personal communication 1996), indicating that cypress forest restoration may also benefit red-cockaded woodpeckers.
2. Available habitat condition - flatwoods with significant midstory components are not preferred by the red-cockaded woodpecker, indicating that a portion of the existing mesic flatwood/mesic hammock acres on the SGGE Restoration Project site may be, and was historically, unavailable for red-cockaded woodpecker use. Cabbage palm midstory invasion

in some areas may not be manageable within budget and personnel constraints and removal of cabbage palm in some areas may be inconsistent with natural succession and biodiversity objectives.

3. Landscape connection - Red-cockaded woodpecker clusters within the Belle Meade portion of the Picayune Strand State Forest and BCNP are separated by approximately 37 miles. Dispersal for red-cockaded woodpeckers has been documented at an apparent extreme of 56 miles but an outside estimate of 7.5 miles was used by Cox et al. (1994) in modeling Strategic Habitat Conservation Areas in Florida for this species. Restored flatwoods on the SGGE Restoration Project may not be immediately available to form a natural dispersal bridge between the BCNP and Picayune Strand red-cockaded woodpecker populations. However, long-term management of this species on the project site could increase the viability of the regional population by increasing the gene pool and offering opportunities for translocation. Pineland management within the project area may also be critical to the adjacent smaller Belle Meade red-cockaded woodpecker population which was in decline prior to public acquisition.
4. Prescribed fire and listed species management - recent and reoccurring wildfire from over drainage and arson has reduced pine habitat on the project site. Restoration of hydrology on the site, combined with prescribed fire management by the site manager, should restore flatwoods lost to wildfire and provide a better base for pine seed generation. Reforestation of pines should also benefit red-cockaded woodpeckers. While old growth pine stands may take 60-70 years to regenerate, red-cockaded woodpeckers in southwest Florida do forage on younger pines, so forage habitat could be increased with management within 5-10 years post restoration.

The largest contiguous block of mesic flatwoods habitat on the restoration site is located in the northwestern project corner and has been deliberately omitted from rehydration in an attempt to protect flatwoods habitat for the red-cockaded woodpecker and the Florida panther. This area is contiguous with pine canopy to the west within the Belle Meade portion of the Picayune Strand State Forest which is currently being managed by the Division of Forestry to increase the red-cockaded woodpecker population on that site.

In summary, the acquisition and restoration of SGGE will establish a contiguous block of public land adjacent to the existing active red-cockaded woodpecker clusters in the Belle Meade portion of the Picayune Strand State Forest west of the project site. Under management for pineland restoration, SGGE may contribute to the recovery of the Belle Meade red-cockaded woodpecker population and to larger populations in BCNP to the east.

Bald Eagle

Restoration of forests within the southern portion of the SGGE Restoration Project site could provide additional roost, perch, and potential nesting habitat in proximity to coastal waters. In Florida, most nests are located within 1.86 miles of open water (McEwan and Hirth 1979, Wood et al. 1989). Nesting would typically occur in mature pine or cypress trees. This habitat is limited on the project site and most pine forests that would be expected to persist within the southern project area would be hydric due to increases in hydrology. A broad estimate of the available hydric pine and cypress habitat within 1.86 miles of open water on the site that may be available or improved for nesting habitat is 3,960 acres based on estimates of pre-development nesting habitat affected by the project located 2 miles north of U.S. 41.

Florida Panther

The entire project area is located within the Primary/Dispersal Zone. Project restoration under Alternative 3D is expected to result in the following effects to the Florida panther and its prey base:

1. Road removal - project alternatives propose to remove 253.7 of 279 miles (2,152.6 acres) of roadway infrastructure from the project. The center of the Picayune Strand will be restricted to non-motorized traffic during most of the year. Limited vehicle access will reduce poaching pressure on panther prey, diminish the potential for illegal panther shooting, and foster an increased prey base. A reduction in panther mortality associated with roadway reduction may affect the number of subadult males, and less frequently the number of subadult females or adults, thereby improving reproductive success and genetic health of the population. Therefore, road removal would be expected to restore 2,152.6 acres of panther habitat within the Primary/Dispersal Zone that currently has zero value to high value wet prairie, flatwoods, cypress and freshwater marsh habitat.
2. Habitat Restoration - the project will increase the panther's ability to feed, breed, and shelter, as a result of direct habitat restoration resulting from removal of disruptive human access and restoration of hydrology on 47,004 acres of wetlands and 16,271 acres of uplands within the project boundary. These are all high quality habitats within the Primary/Dispersal Zone. The project will indirectly increase the panther's ability to feed, breed, and shelter as a result of restoration of a major gap in a contiguous landscape of public land which includes the Belle Meade portion of the Picayune Strand State Forest, Florida Panther National Wildlife Refuge, Fakahatchee Strand State Reserve, BCNP and ENP. An increase in restored habitat may increase habitat availability to dispersing panthers, affecting the number of subadult males available to move into the core panther population, thereby increasing the reproductive success and genetic health of the population. Habitat restoration and exclusion of disruptive human access may provide for use of the site by breeding females, which do breed in habitats within the adjacent Fakahatchee Reserve under a more natural hydrological condition.
3. Reduction of Panther/Human Interactions - studies of the western mountain lion indicate temporary human residence or presence will negatively effect habitat value. Persistent or

concentrated human presence results in the avoidance of suitable habitat. This loss occurs even without significant physical alteration of the habitat (Van Dyke et al. 1986). The project may increase panther use of the project area as a result of reduction of disturbance (noise, light, pollution) generated by the roadway/human presence. The project will increase the panther's prey species as a result of direct and indirect habitat improvements associated with road removal and subsequent habitat restoration.

4. Infrastructure construction - Preliminary estimates of project effects to high value panther habitat (flatwoods, wet prairie, freshwater marsh and cypress) associated with project construction include 17.34 acres due to spreader swale construction, 49.13 acres for intake canal/berm and 79.7 acres associated with the project perimeter berm (if constructed) along Miller Boulevard. Canals are considered to have zero panther habitat value and therefore backfill activities will not affect panther habitat. Existing berms that will remain as part of the project infrastructure construction will not change in value. The area associated with the Miller Boulevard berm will be high quality habitat both before and after construction. The total effect is therefore estimated to be 66.47 acres of high quality habitat within the Primary/Dispersal Zone lost to construction effects.

Wood Stork

Depletion of surface water and surficial groundwater levels caused by drainage activities within the SGGE Restoration Project area have shortened the hydroperiod of wetlands on the project site and caused the prey base to shift from species that lay eggs in shallow ephemeral ponds to those that bear live young. Over drainage of the project site has: (1) severely restricted or eliminated surface water connections between wetlands and limited dispersal of forage fish; (2) has reduced the size of wetlands, reduced species diversity, increased competition among fish species, increased predation of forage fish species; (3) isolated wetlands from dry-season or drought-resistant deep water refugia; and (4) caused an increase in unwanted exotic species (Ceilley and Ceilley 1999). Establishment of more natural hydroperiods as a result of project restoration efforts will improve wetland and ecological functions and values in the project area. The direct benefits under Alternative 3D based on Table 30-1 include the restoration of 11,148 additional acres of wet prairie (primarily converted from hydric flatwoods) and 962 additional acres of cypress marsh from the existing condition. In total, however, Alternative 3D could result in the restoration of 47,004 acres of potential wood stork forage habitat to quality habitat conditions. For a conservative analysis, we have tallied the 12,110 acres of additional cypress and wet prairie as wood stork habitat gained.

Canals that remain on the site will provide permanent habitat for predatory species of native and exotic fish. Predatory fish prey upon smaller fish species that provide an important forage base for wood storks. Wet season rainfall could result in access for predatory fish to isolated wetlands and increased predation of small fishes on the site, reducing the small fish forage base for wood storks.

Operational management of project infrastructure is critical in determining the effects of the project on wood storks. During wet years, water management practices could prevent the formation of shallow pools that concentrate wood stork forage fishes. During dry years, water

management practices could over drain the freshwater sloughs, reduce freshwater flows into the mainland estuaries, and reduce wetland productivity of wood stork forage fishes. Variable water management practices could increase or decrease frequencies of wood stork nest failure in area rookeries.

Eastern Indigo Snake

Table 30-1 describes restoration under Alternative 3D that would increase mesic flatwoods by 1,449 acres, decrease hydric flatwoods by 11,247 acres, increase wet prairie by 11,148 acres and cypress marsh communities by 962 acres from the existing (1995) condition. The replacement of hydric flatwoods with wet prairie is not expected to significantly effect forage availability due to the drained condition of hydric flatwoods under existing conditions. In addition, indigo snakes forage in all of these habitats. The incomplete hydrologic restoration of SGGE to historic natural conditions in the northwest corner of the project was intentional, so as to retain some upland habitat for terrestrial wildlife such as eastern indigo snakes. In addition to the drained condition of existing habitats, the existing project is bisected by roads every quarter mile. This extensive road system leaves this species open to highway mortality and human-related disturbance. The removal of hundreds of miles of road with resulting restriction in human access will produce a large block of relatively wild habitat for this snake. SGGE is a critically important segment in the consolidation of a landscape that will connect the Belle Meade Tract of Picayune Strand State Forest, the Florida Panther National Wildlife Refuge, and the Fakahatchee Strand State Preserve. Since all the non-road habitats will support indigo snakes both before and after the project, we have tallied the 2,152 acres of roadways that will be restored to natural conditions.

Indigo snakes could be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Everglades Snail Kite

Table 30-1 indicates that cypress and marsh communities will increase by approximately 962 acres from the existing condition. Although most of the habitat on the site is short-hydroperiod wetlands or forested wetlands which do not typically support snail kite forage activities, there is potential for hydrology to be restored in isolated marsh systems that may increase potential snail kite habitat on the site.

American Crocodile

Drainage canals and impervious surface runoff associated with the SGGE subdivision development have changed the seasonal timing and discharge of sheet flows to Pumpkin, Blackwater, Faka Union and, to a lesser extent, Fakahatchee Bays. Point source discharges have potentially reduced the production of fish and other aquatic species that provide forage for the American crocodile.

The timing and frequency of the freshwater hydroperiod influences the health of the estuarine environment in south Florida and may be one of the most important large-scale factors influencing crocodile populations. When added to all other natural and anthropogenic sources of mortality, such habitat changes could have negative effects on crocodile nesting and hatchling survival. As advances in water management are made in south Florida, research is expected to continue to assess the effects on the American crocodile of changes in the amount and timing of water delivery (F. Mazzotti, telephone communication, November 14, 1996). Maintenance of osmotic balance requires access to low salinity water for juveniles. Temperature changes related to freshwater input may be a factor in influencing forage activities. Because there is no estuarine model that can quantify changes in flow to individual downstream estuaries, an evaluation of proposed alternatives could be based on percentage of point source discharge reduction over the existing condition. Therefore, if Alternative 3D was anticipated to reduce flows through Faka Union Canal by 75 percent, then it could be theorized that Alternative 3D is offering 75 percent restoration benefits over the existing condition. Alternatives could only be evaluated compared to the existing condition. However, some minimal flow and seasonal fluctuation should be maintained from Faka Union canal to maintain the health of the downstream estuary. This additional flow could be considered an additional benefit, as dry season flows are limited under the existing condition.

The restoration will have little direct affect on crocodile nesting or resting habitat unless potential undefined behavioral changes result from alterations in freshwater flow. Natural hydroperiods will likely provide sufficient freshwater to periodically flush sediments from creek beds and maintain deepwater refugia for breeding adults. Restored hydroperiods also will decrease average salinities during late summer, when hatchlings require low-salinity water.

Fish and Wildlife Resources - State Listed Species

The following fish and wildlife species (Table 30-2) and plant species (Table 30-3) are state listed as either threatened (T), endangered (E), or of special concern (SSC), and may occur or are known to occur in the study area. The listed plant species (Table 30-3) were obtained from the Florida Department of Agriculture and Consumer Services (Coile 2000).

Table 30-2. Species listed by the Florida Freshwater Fish and Wildlife Conservation Commission as threatened (T) or of special concern (SSC), excluding those that are also federally listed.

Common Name	Species Name	Status
REPTILES		
American alligator	<i>Alligator mississippiensis</i>	SSC
Gopher tortoise	<i>Gopherus polyphemus</i>	SSC
AMPHIBIANS		
Gopher frog	<i>Rana capito</i>	SSC
BIRDS		
American oystercatcher	<i>Haematopus palliatus</i>	SSC
Black skimmer	<i>Rynchops niger</i>	SSC
Brown pelican	<i>Pelecanus occidentalis</i>	SSC
Burrowing owl	<i>Speotyto cunicularia</i>	SSC
Florida sandhill crane	<i>Grus canadensis pratensis</i>	T
Least tern	<i>Sterna antillarum</i>	T
Limpkin	<i>Aramus guarana</i>	SSC
Little blue heron	<i>Egretta caerulea</i>	SSC
Peregrine falcon	<i>Falco peregrinus</i>	E
Reddish egret	<i>Egretta rufescens</i>	SSC
Roseate spoonbill	<i>Ajaia ajaja</i>	SSC
Snowy egret	<i>Egretta thula</i>	SSC
Southeastern American kestrel	<i>Falco sparverius paulus</i>	T
Southeastern snowy plover	<i>Charadrius alexandrinus tenuirostris</i>	
Tricolored heron	<i>Egretta tricolor</i>	SSC
White ibis	<i>Eudocimus albus</i>	SSC
White-crowned pigeon	<i>Columba leucocephala</i>	T
MAMMALS		
Big Cypress fox squirrel	<i>Sciurus niger avicennia</i>	T
Everglades mink	<i>Mustela vison evergladensis</i>	T
Florida black bear	<i>Ursus americanus floridanus</i>	T
MOLLUSCS		
Florida tree snail	<i>Liguus fasciatus</i>	SSC

Table 30-3. Plant species listed by the Florida Department of Agriculture and Consumer Services as threatened (T), endangered (E), or commercially exploited (C), excluding those that are also federally listed.

Common Name	Species Name	Status
Giant leather fern	<i>Acrostichum danaeifolium</i>	C
Satinleaf	<i>Chrysophyllum oliviforme</i>	T
Cowhorn(=cigar) orchid	<i>Cytopodium punctatum</i>	E
Beach creeper	<i>Ernodea littoralis</i>	T
Butterfly orchid	<i>Encyclia tampensis</i>	C
Simpson's ironwood; Simpson's stopper	<i>Myrcianthes fragrans</i> (= <i>Eugenia simpsonii</i>)	T
Giant sword fern	<i>Nephrolepis biserrata</i>	T
Hand adder's tongue fern	<i>Ophioglossum palmatum</i>	E
Florida royal palm	<i>Roystonea elata</i>	E
Inflated (=reflexed) wild pine	<i>Tillandsia balbisiana</i>	T
Common (=stiff-leaved) wild pine	<i>Tillandsia fasciculata</i>	E
Twisted and banded air plant	<i>Tillandsia flexuosa</i>	E
Fuzzy-wuzzy (=hoary) air plant	<i>Tillandsia pruinosa</i>	E
Giant wild pine; Giant air plant	<i>Tillandsia utriculata</i>	E
Soft-leaved wild pine	<i>Tillandsia valenzuelana</i>	T
Spanish moss	<i>Tillandsia usneoides</i>	T
Sea lavender	<i>Tournefortia gnaphalodes</i>	E

The intent of the SGGE Restoration Project is to restore the pre-development sheet flows and hydroperiods needed to recover habitat for the reestablishment and enhancement of the historic native plant communities. Restoration of the historic hydrology and elimination of the extensive road grid should reduce the incidence of plant poaching by collectors and help reduce the frequency and intensity of wildfires.

Conservation Recommendations

West Indian Manatee

1. Fund further development of a spatially-explicit, individual-based model for manatees to better understand how changes in hydrology associated with restoration of SGGE and the Everglades may affect the distribution and abundance of manatees. Initial construction of the individual-based model already has been accomplished through funding from USGS Place-Based. Four key GIS layers are used by the model. A detailed bathymetric layer will restrict the simulated movements of manatees to appropriate water depths. Initial analysis of the radio tracking data shows that most locations are in water of 12 feet or less. Salinity layers showing the location of freshwater (< 5 parts per thousand) will be used to identify areas

where manatees periodically return to drink freshwater water. Radio tracking data and field mapping are being used to identify key foraging areas with high quality submerged aquatic vegetation. The fourth layer will identify sites that serve as winter thermal refugia.

2. Conduct a comprehensive field study in the region to provide data for the spatially-explicit model and to document the current distribution and status of the manatee population prior to implementation of restoration activities. Two years of field data have already been collected through funding from USGS Place-Based Studies. Provide for at least 1 more year of baseline studies, conduct interim studies based on project schedule to determine effects of project phasing on manatees using an adaptive management approach, and conduct 3 years of post-restoration field studies.
3. Conduct construction activities consistent with the Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* if in-water activities (currently not anticipated) are needed in Faka Union Canal south of Faka Union Weir No. 1.
4. Provide a baseline, mid-project, and post-project assessment on manatee congregations (warm-water refugia) at the Port of the Islands Marina Basin.
5. Provide a baseline, mid-project, and post-project assessment of the Port of the Islands marina basin depth, temperature, and flow input from Faka Union Canal.
6. Conduct baseline and post-project (5-year intervals for 20 years) seagrass surveys in Faka Union Bay.
7. Conduct a pre-project analysis of boat traffic in the Faka Union Marina basin/Canal system and in adjacent restoration-affected bay systems based on available information. Use this analysis to determine the potential for boat-related mortality associated with potential manatee habitat use pattern changes associated with post-restoration changes in freshwater discharges.

Florida Panther

1. Conduct a 1-year pre-project baseline and post-project (5-year intervals for 20 years) prey density studies using aerial transects consistent with FWC-recommended methodology.
2. Assess and characterize pre-project panther telemetry in the project area to include Fakahatchee, BCNP, Belle Meade portion of Picayune Strand State Forest, and Florida Panther National Wildlife Refuge. Assess and characterize post-project panther telemetry including abundance and distribution of panthers over landscape, changes in habitat utilization if any, numbers of breeding females, and changes in population age distribution. Post-project assessment should be conducted every 3 years.

3. Coordinate with FWC to determine if panther denning activities are occurring in potential project construction areas.
4. Assess road plan effects on Florida panther.
5. Assess recreational or management effects on Florida panther if adopted as part of the federal project or state management plan consideration.

Wood Stork/Snail Kites/Eastern Indigo Snakes

1. Monitor the hydrological effects of the project design by conducting an additional baseline vegetation transect study in 2004 and conducting post-project transect studies (5-year intervals for 20 years).
2. Monitor the hydrological effects of the project design by monitoring surface and groundwater data in all existing and proposed wells and compare to baseline conditions.
3. Assess operational plan effects on project uplands and wetlands. Modify to improve restoration benefits if warranted. Restoration is defined as pre-development condition of uplands and wetlands.
4. Assess the potential for exotic fish populations to move from canals to natural wetlands and affect wood stork forage fish populations post-restoration.

Wood Stork

1. Monitor the yearly productivity of storks utilizing nesting colonies within 18.6 miles of the project site.
2. Conduct a baseline wading bird survey during the wet season (July 1 through January 30). Replicate this survey on a yearly basis during project construction, 1 year after restoration and at 5-year intervals for 20 years thereafter.

Red-Cockaded Woodpecker

1. Conduct/assess baseline population surveys of red-cockaded woodpecker's within Belle Meade, SGGE, Fakahatchee, and BCNP.
2. Conduct/assess post-project baseline population surveys of red-cockaded woodpecker's in Belle Meade, SGGE, Fakahatchee, and BCNP at 5-year intervals beginning 5 years after project completion.

American Crocodile

1. Assess pre and post-project crocodile nesting or sighting information to determine if changes in hydrology have contributed to additional habitat protection or use.

Downstream effects

The SGGE Restoration Project is located within the watershed of the Ten Thousand Islands estuary which includes significant public land holdings, including Collier Seminole State Park (Blackwater Bay vicinity), Ten Thousand Islands Aquatic Preserve, Ten Thousand Islands National Estuarine Research Reserve, Ten Thousand Islands National Wildlife Refuge (Blackwater, Buttonwood, Pumpkin, Santina, Faka Union, and Fakahatchee Bay vicinities), Fakahatchee Strand State Preserve (Fakahatchee Bay vicinity), and the western edge of ENP (Fakahatchee Bay vicinity). The Ten Thousand Islands Estuary is a subtropical coastal ecosystem that includes important mangrove and marsh habitats, a rich diversity of native wildlife, and habitat for several notable threatened and endangered species including the American crocodile and West Indian manatee. Faka Union Bay receives the majority of freshwater input from the SGGE through the main Faka Union Canal. Other bays historically received freshwater input from the SGGE but flows were disrupted or circumvented by the SGGE development and the Faka Union Canal network. Alterations in timing and quantity of freshwater flowing into an estuary can effect natural biodiversity of the estuary by effecting food availability, predation pressure, and reproductive success, as well as directly cause chronic and acute stress. Freshwater inflow can influence primary productivity, zooplankton biomass and abundance of other aquatic animals by influencing nutrient concentrations. Salinity data collected at 30-minute intervals over 3 years within Faka Union Bay and Fakahatchee Bay (reference site for the area) indicate alterations in both the salinity pattern and fluctuation as a result of the freshwater flowing into Faka Union Bay through the Faka Union canal (Rookery Bay National Estuarine Research Reserve, unpublished data).

There has been a decrease in salt marsh and moderate increases in mangrove swamp and open water between 1940 and 1995 (Corps 2003b). The general northward advance of mangroves into the salt marshes is likely due, at least in part, to reduced freshwater flows into Faka Union Bay from SGGE. There are also more lakes within the mangrove community in 1995 than are indicated in the 1940 vegetation map. However, other factors such as an altered fire regime and sea level rise could also be involved. Since the MIKE-SHE hydrology model does not include this area, the relative importance of these various influences cannot be determined.

Restoration of sheetflow conditions in the SGGE and a reduction of point source discharges into Faka Union Bay should improve oyster health, physiology, and distribution. Benthic, mid-water, and fish plankton communities within Faka Union Bay should improve and relative abundance of mid-water fish should increase. Seagrass meadows should increase within Faka Union and other bays that are dominated by bare, sandy mud and algal areas. Increases in seagrasses and mid-water fish populations should benefit the West Indian manatee and American crocodile.

Coordination with Corps and District for the Southern Golden Gate Estates Hydrologic Restoration Project

The Corps provided a Biological Assessment, dated October 17, 2001, that initiated consultation on the West Indian manatee, red-cockaded woodpecker, Florida panther, wood stork, snail kite, and eastern indigo snake. The Corps concluded that the project will be “beneficial” to the wood stork and American crocodile; and “may affect, but is not likely to adversely affect, the Florida panther, eastern indigo snake, red-cockaded woodpecker, and West Indian manatee. The Service has not concurred with this determination pending identification of a preferred project alternative, additional information needs, and potential project monitoring and management measures that would minimize effects to listed species. The Service does concur that the effects to the bald eagle are discountable. NOAA-Fisheries has indicated that no formal consultation will be pursued on off-shore sea turtles, or listed or candidate fish species.

The Service has discussed and commented on the effects of the project on federally listed species in considerable measure since project inception under the Water Resources Development Act of 2000. The administrative record should be consulted with regard to this extensive informal consultation process. The Service also participated in review of the project in concert with project development by the District in 1996.

Section 7 consultation documents

October 19, 2003. The Service provided comments on the Prairie Canal early start project under the Fish and Wildlife Coordination Act and the Endangered Species Act recommending approval of that portion of the project upon finalization of fish and wildlife/protected species management plans and a resurvey (and remediation if necessary) a portion of the project for contaminants (selenium).

October 1, 2003. The Service provided comments on the Phase I/II Environmental Site and Ecological Risk Assessment for a 600-acres portion of the project site recommending further sampling in specific locations for high selenium indicated by sampling results. Sampling results indicated isolated areas had significant risk for sediment-dwelling organisms and fish due to toxaphene contamination.

August 11, 2003. In response to analysis of various hydrological model results, the Service submitted a PAL to the Corps recommending consistent application of hydrological and meteorological data in developing Standard Project Flood and Standard Project Storm criteria using input data from regional rainfall models. The recommendations included development of a “white paper” on the subjects by an interagency peer group and a separate CERP guidance memorandum on flood damage assessment procedures.

January 3, 2003. Preliminary Draft Integrated PIR and Environmental Impact Statement.

January 17, 2003. The Service provided a PAL to the Corps which summarized the project status and recommended that: (1) restoration benefits be evaluated with respect to the pre-development condition, as well as the existing and 2050 without-project condition; (2) evaluation of all major alternatives developed by the PDT, Corps and District; and (3) the project include ecological and water quality performance measures or indicators, in addition to hydrological performance measures.

January 9, 2002. The Service received a project description from the Corps for purposes of proceeding with the FWCA Report.

July 19, 2002. The Service provided a No Comment letter on the Corps Notice of Intent to Prepare an Integrated Draft Project PIR and Environmental Impact Statement, noting the continued active participation of the Service in all of the project planning elements.

February 2, 2001. The Service provided detailed comments to the Corps on the Preliminary Draft SGGE Project Management Plan (PMP). These comments included flood control/wetlands protection in Northern Golden Gate Estates, water supply issues related to the City of Naples well field in Northern Golden Gate Estates, the importance of providing a water regulation schedule, review by RECOVER, the Draft Picayune Strand State Forest Post Restoration Road Plan, the Biological Assessment for listed species on the site, and baseline fish and wildlife studies.

October 17, 2001. The Service received a Biological Assessment from the Corps indicating that the project would be beneficial for the wood stork and American crocodile and “may effect, but is not likely to adversely effect” the snail kite, eastern indigo snake, Florida panther West Indian manatee, and red-cockaded woodpecker.

October 27, 1999. The Service submitted a PAL to the Corps outlining fish and wildlife resource concerns, including the effects to freshwater and estuarine systems resulting from over-drained conditions in the SGGE Restoration Project area. The Service noted the need for updated vegetation and baseline fish and wildlife surveys, a review of the potential effects of pollutants, listed species concerns, and analysis of the downstream effects of a preferred alternative on the Ten Thousand Islands. The Service also recommended an adaptive management approach to project phasing, coordination with other state and federal landowners and entities, a long-term project monitoring program, and the need to develop performance measures for the project.

Florida Keys Tidal Restoration Project description

The purpose of the Florida Keys Tidal Restoration Project is to restore a portion of the tidal connection that was eliminated in the early 1900s during the construction of Flagler's railroad. Much of U.S. 1 through the Florida Keys has been located on Flagler's railroad footprint. For perspective, of the 40 miles of U.S. 1 connecting the islands of the middle Keys, about 8 miles, or about 20 percent, of U.S. 1 in the middle Keys is located on fill placed for the construction of Flagler's railroad (Lott et al. 1996). Restoration of all four proposed sites would represent 3,300 ft, or about 8 percent, of the tidal connectivity lost in the middle Keys during construction of Flagler's railroad (Brian Keller, NOAA-Fisheries, personal communication 2003).

The fill that was placed during construction of the railroad has resulted in stagnant conditions and accumulation of sediments and organic matter that have eliminated seagrass and hard bottom communities in the vicinity of the fill. Restoring the circulation to areas of surface water that have been impeded and stagnant for decades would significantly improve localized water quality, benthic floral and faunal communities, larval distribution of both recreational and commercial species (*e.g.*, spiny lobster), and the overall hydrology of Florida Bay (Corps 1999).

This project includes the use of bridges or culverts to restore the tidal connection between Florida Bay and the Atlantic Ocean in Monroe County. Four sites had originally been proposed in the middle Keys between Mile Markers 54 and 57 along U.S. 1 in Monroe County (Fig. 31-1). The four locations are as follows: (1) Tarpon Creek, just south of Mile Marker 54 on Fat Deer Key (150 feet wide); (2) "Site 2," an unnamed creek between Fat Deer Key and Long Point Key, south of Mile Marker 56 (450 feet wide); (3) a tidal connection adjacent to Little Crawl Key (300 feet wide); and, (4) a tidal connection between Florida Bay and Atlantic Ocean at Mile Marker 57 (2,400 feet wide).

Cost constraints made it necessary for the PDT to choose one site for restoration. Consequently, a sub-team of the PDT produced a matrix to select the most representative site that would be used to define alternatives. The matrix considered more than 40 criteria split into groups including real estate, regulatory factors, engineering and geotechnical considerations, environmental issues, and socioeconomic impacts. For each site, each criterion was scored either a -1 if the factor was considered negative, a 0 if it was considered neutral, or a +1 if the factor was considered positive for the restoration of each candidate site. After scoring with this method the PDT determined that Site 2 (Fig. 31-2) would be the preferred site for restoration.

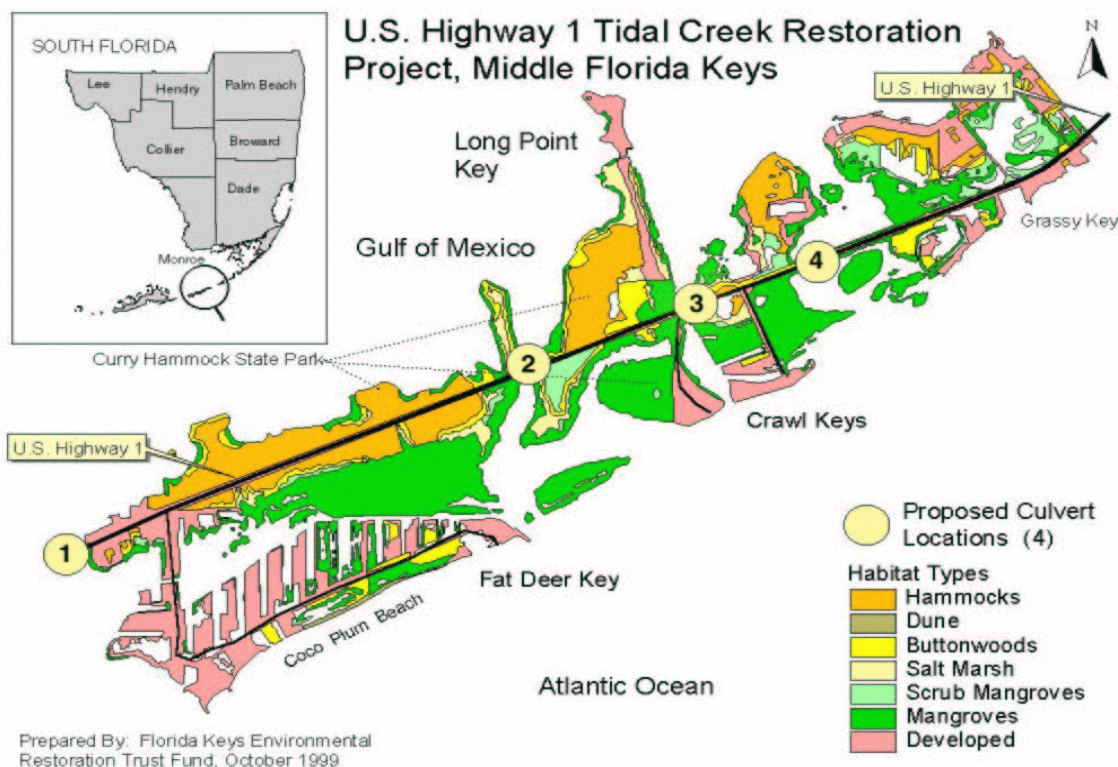


Figure 31-1. Florida Keys Tidal Restoration Project area.

Project footprint

Service staff conducted field surveys of Site 2, as well as of the other candidate sites (Service 2003). Like the other candidate sites, Site 2, has both a bay-facing component and an ocean-facing component. In the case of Site 2, the shoreline of both sides are fringed with red mangroves. On the bay side this fringe averages 43 feet in width, for an area of 0.45 acre, while on the ocean side it averages 89 feet in width, for an area of 0.93 acre. The total area covered by mangroves on Site 2 is 1.4 acres.

Beyond the mangrove fringe, both sides of Site 2 includes a “barren zone” that consists of very soft, flocculent ooze and which appears to act as a sediment trap. No submerged aquatic vegetation is associated with this zone. In addition, the portion of these areas closest to U.S. 1 are occasionally covered by floating wrack composed of seagrass blades and drift algae that has been driven by wind into the blind pockets formed by the filled cuts. Presumably, this phenomenon contributes detritus to this area, lowers levels of dissolved oxygen, and decreases light penetration to the benthic habitat. The barren zone on the bay side covers approximately 1.4 acres, while on the ocean side it covers approximately 0.98 acre.



Figure 31-2. Aerial photograph of selected site (Site 2) for tidal flow restoration for the Florida Keys Tidal Restoration Project.

Both sides also exhibit a transitional area seaward of the barren zone. The transitional zone on the bay side measures about 8.7 acres and supports turtle grass and shoal grass, with a coverage of 30 to 40 percent at the time of the survey (late spring to early summer 2002). The transitional zone on the ocean side exhibits a somewhat more complex situation. Seagrass coverage ranged from 60 to 70 percent at the time of the survey, with turtle grass comprising 70 to 80 percent of the total cover. In addition, a well-defined channel runs from the head (*i.e.*, nearest the causeway) of the cut to the mouth, where a shoal has developed between the historic creek path and an existing tidal slough that approached the cut from the southeast. It is unclear from this analysis where the historic channel was from this point; however, the southeast slough is very shallow, and exposed seagrass was observed at low tide. A hard-bottom flat occurs seaward of the transitional zone.

Because the effects of mobilizing accumulated sediments is a potential issue to consider with this project, the Service estimated the volume of unconsolidated matter that might be affected. For the bay side, this volume was calculated at nearly 46,000 cubic yards. For the ocean side, it was estimated to be over 75,000 cubic yards.

For the purpose of an analysis for threatened and endangered species it is assumed that either a bridge or series of culverts would be used to re-establish tidal flow at Site 2. Both bridge and culvert alternatives are expected to effect the mangrove bands and disperse accumulated sediments in the channel. A bridge would result in the complete removal of all 1.4 acres of fringe mangrove and the road bed itself. For the culvert alternative, an estimated 17 6-foot box culverts would be placed under U.S.1 at 20-foot intervals to achieve a more natural flow regime. This alternative would allow the road bed to remain but would also likely result in the loss of roughly 1.4 acres of fringe mangroves due to the increase in flow velocity caused by the culverts.

Threatened and Endangered Species and Designated Critical Habitats

West Indian manatee

The West Indian manatee occurs within the project area and may be affected during construction and later by damage to seagrass beds. According to available information, manatees utilize the project area for feeding, resting, and calving (FWC aerial survey data). Although no critical habitat has been designated within the project area, surveys indicate the presence of seagrasses and mangroves, both important food items for manatees. Resuspension of sediments currently trapped in the barren zone may cause a short-term reduction in the areal extent of seagrass beds in the immediate vicinity of the project. The effect on manatees is, however, expected to be negligible due to the existence of large areas of seagrass that would remain nearby and the expectation that effects on the seagrass beds in the immediate vicinity would last only for the short term.

The project is currently evaluating the use of either box culverts or a bridge to provide tidal flow through project area. Comparing the two alternatives, it appears that the bridge alternative would be less intrusive; however, 1.4 acres of fringe mangrove would be lost. The use of culverts would also result in the complete loss of 1.4 acres of fringe mangroves. Additionally, a minimum culvert opening of 6 feet is necessary to avoid adverse effects to manatees because manatees can become entrapped and drown in culverts of lesser size. Since the culvert alternative would use 6-foot box culverts, entrapment and drowning would be unlikely. The elevation of the culverts should be designed to allow airspace for air breathing aquatic organisms, such as manatees and other marine mammals that may travel through them. During the construction phase of the project the *Standard Manatee Construction Protection Measures and/or Marine Mammal Blasting Protocols* should be followed, avoiding any harm due to construction disturbance.

American crocodile

Critical habitat designated for the American crocodile extends to the western most tip of Long Key, which is located approximately 8 miles north of the project area. Possible negative effects of installing a bridge would be the loss of 1.4 acres of fringe mangrove and roadbed, which may be used for basking and foraging by crocodiles. Benefits would include a safe travel corridor between the Atlantic Ocean and Florida Bay and possible increase in prey items traveling through the passage. The use of culverts would provide the same benefits but would not negate the possibility of road mortality if a crossing were attempted.

Eastern indigo snake

Eastern indigo snakes may use the roadbed and fringe mangroves located within the project footprint. The construction of a bridge would eliminate 1.4 acres of roadbed and adjacent fringe mangrove, which may be used by indigo snakes. Installation of culverts will also cause the loss of 1.4 acres of indigo snake habitat, but would retain a possible travel corridor associated with the roadbed once construction is complete. The Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction, to avoid direct harm.

Bald eagle

No recent bald eagle nesting activity has been recorded in the Florida Keys Tidal Restoration Project area. The fringe mangroves located in the project footprint may be considered marginal habitat for perching and foraging for eagles passing through the area.

Coordination with the Corps and the District for the Florida Keys Tidal Restoration Project

March 7, 2001. Technical Scope Formulation PDT meeting.
May 15, 2001. PDT meeting.
June 10, 2002. PDT meeting for Hydrodynamic Model Review.
August 2, 2002. Draft American Crocodile Performance Measure.
August 9, 2002. PDT meeting.
December 19, 2002. PDT meeting.
January 29, 2003. Performance measure sub-team conference call.
February 12, 2003. Performance measure sub-team conference call.
March 2003. Email to project managers relaying a draft of this write-up, comments requested.
March 20, 2003. Performance measure sub-team conference call.
April 9, 2003. Planning Aid Report.
April 24, 2003. Ecological and Performance Measure sub-team conference call.
May 6, 2003. PDT Meeting.
May 14, 2003. Habitat and incremental lift discussion meeting, Jacksonville.
August 7, 2003. PDT Meeting.
September 24, 2003. Sub-team conference call.

Section 7 consultation documents

No section 7 consultation has occurred for this project.

32 Lake Okeechobee Aquifer Storage and Recovery Pilot

Lake Okeechobee ASR Pilot Project description

The concept of ASR in the CERP is to store partially treated, available surface water or groundwater in ASR wells, completely within the underlying Floridan Aquifer System (FAS) for subsequent recovery during periods of need. Among other benefits, implementation of ASR technology within the Lake Okeechobee Basin could help to minimize high-volume stormwater releases to the lake and the Caloosahatchee and St. Lucie Estuaries. The potential advantages of ASR are the following: (1) reduced costs and space for land acquisition compared with surface storage facilities; (2) underground storage eliminates water losses due to evapotranspiration; (3) wells can be located in areas of greatest need, depending on geology, reducing water distribution costs; and, (4) provides the ability to recover large volumes of water during severe droughts, presumably when reservoir levels would be low.

The purpose of the Lake Okeechobee ASR Pilot Project is to explore the feasibility of storing water from the Kissimmee River, the lake, and the C-43 and C-44 canals. This pilot project may lead to full-scale implementation of ASR wells around Lake Okeechobee. The Lake Okeechobee Pilot Project is proposed to take place at three sites (Figs. 32-1 through 32-4).

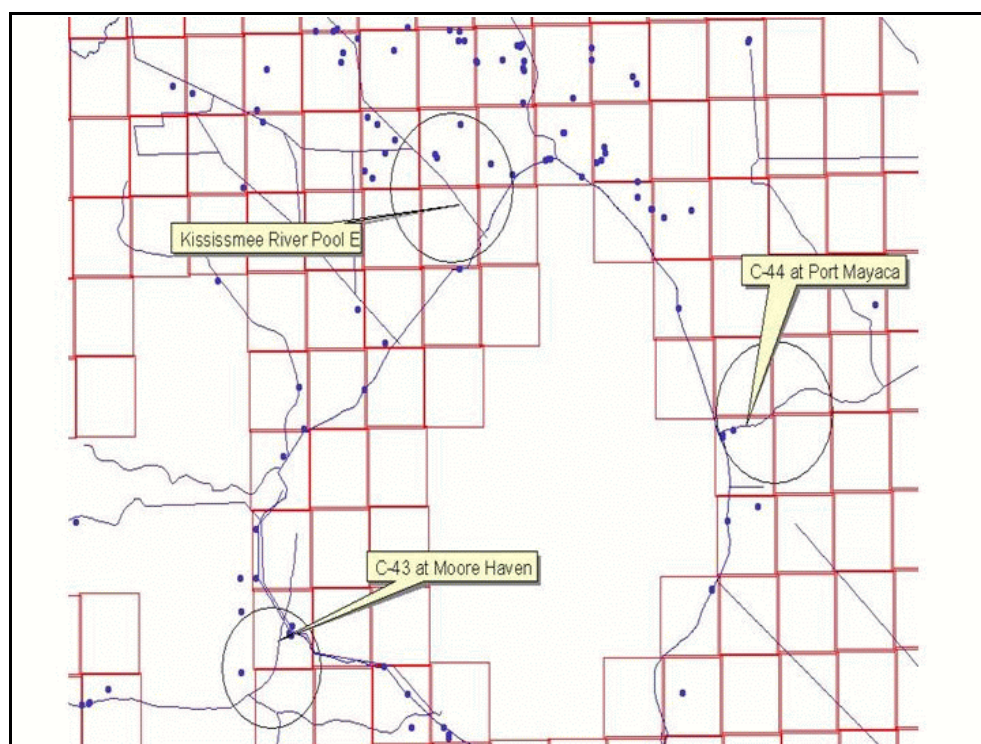


Figure 32-1. Lake Okeechobee Aquifer Storage and Recovery Pilot Project sites.

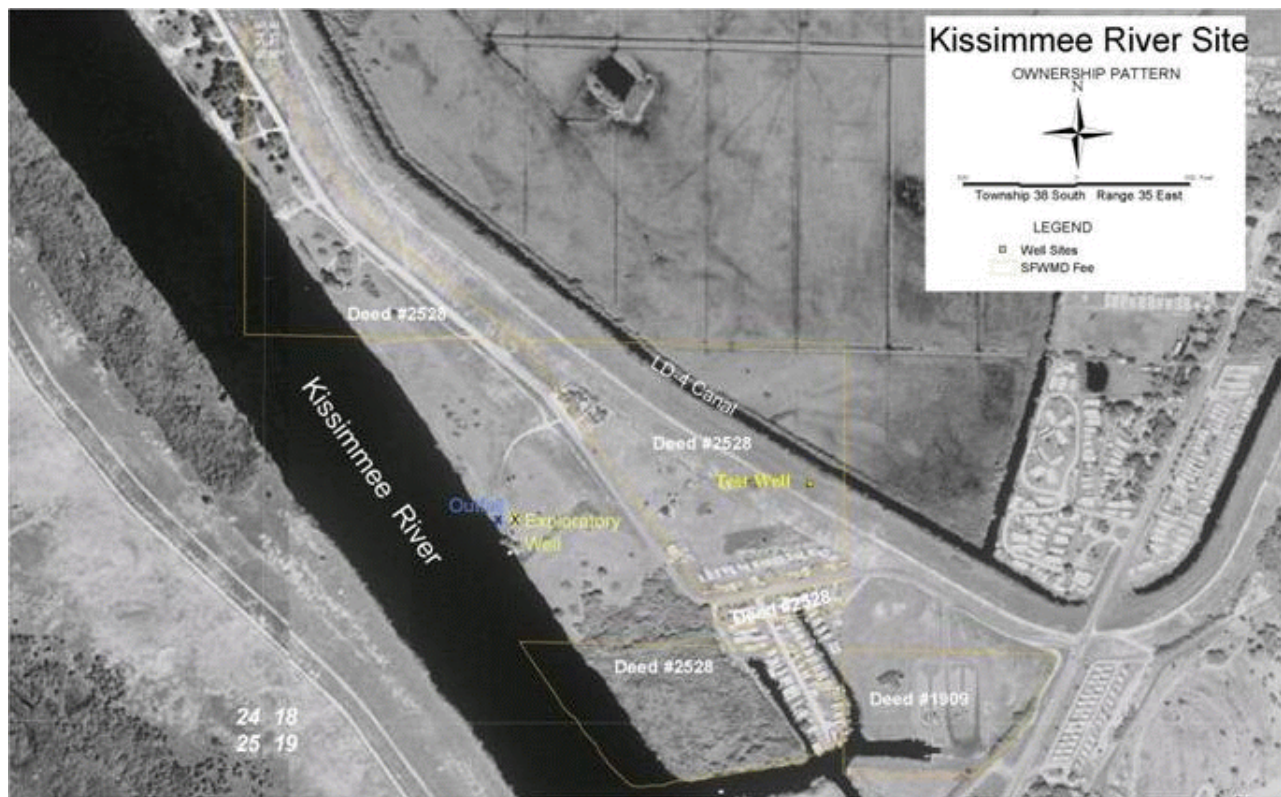


Figure 32-2. Exploratory well site for the Kissimmee River site of the Lake Okeechobee Aquifer Storage and Recovery Pilot Project. This site is located off the Kissimmee River in Okeechobee County, approximately 8,000 feet from the river's connection to Lake Okeechobee and north of Route 78. Specifically, it is located at latitude N 27° 09' 18.7", longitude W 80° 52' 29.7" (Corps 2004).



Figure 32-3. Exploratory well site for the Mayaca site of the Lake Okeechobee Aquifer Storage and Recovery Pilot Project on the east side of the lake. This site is located in Martin County along the St. Lucie Canal, also known as the C-44 canal, latitude N 26° 59' 17", longitude W 80° 36' 22". This location is approximately 2,000 feet south of the Herbert Hoover Dike, south of the service access road, and approximately 100 feet west of the intersection with the L-65 canal. A sugar cane field is present to the north (Corps 2004).

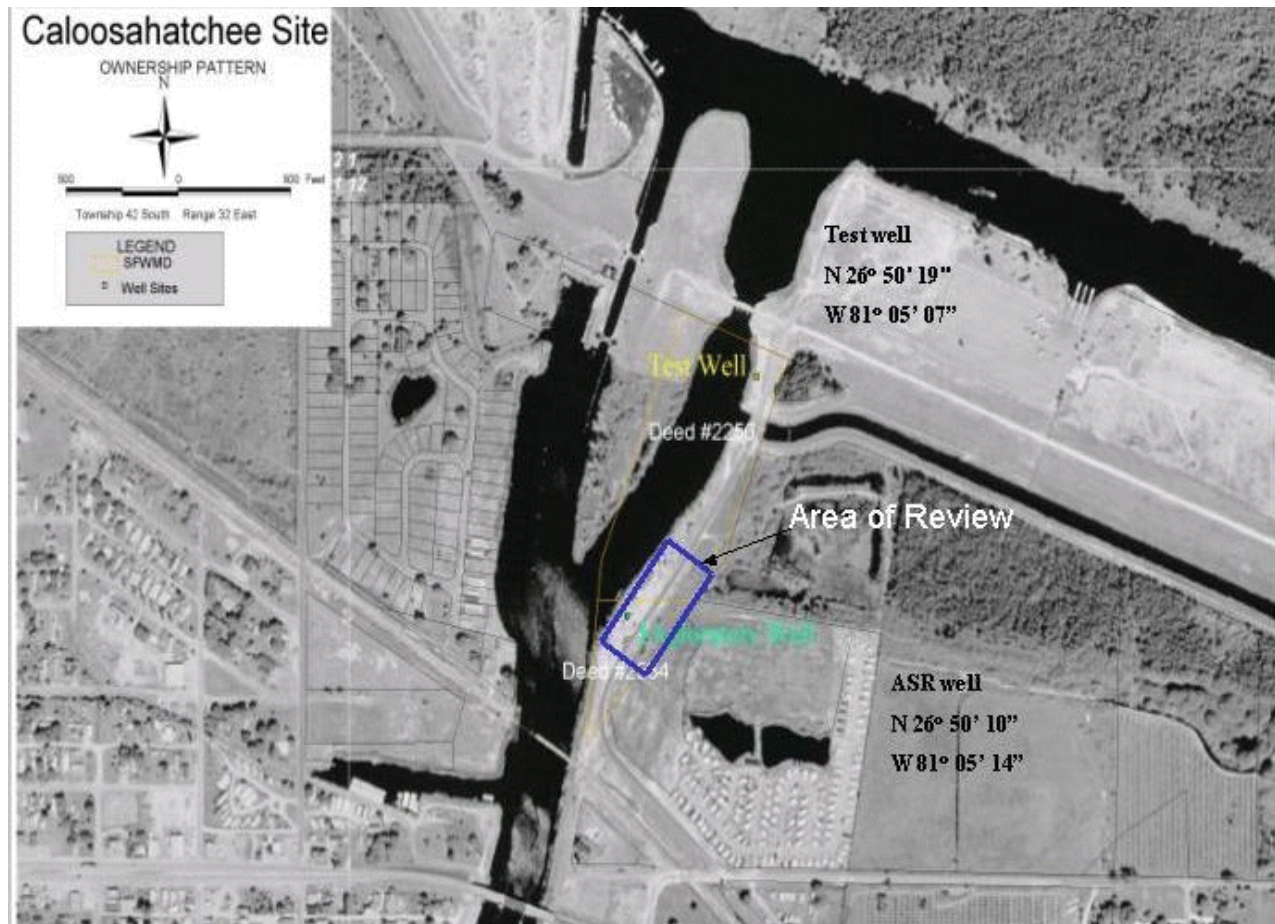


Figure 32-4. Proposed location for the Moore Haven site of the Lake Okeechobee Aquifer Storage and Recovery Pilot Project. This site is approximately 500 feet north of Highway 27, northwest of a housing community, and adjacent to the Caloosahatchee River (C-43 canal) at Latitude N 26° 50' 10", Longitude W 81° 05' 14" (Corps 2004).

The Lake Okeechobee ASR Pilot Project proposed three sites include:

- a. Port Mayaca Site. The area for the exploratory well, injection well, and pump station is north of the C-44 Canal. It is approximately 4.5 acres in size. The immediate area is best described as “disturbed” primarily as a result of vegetation removal and grading for use as the disposal site for the Lake Okeechobee pilot dredging project. A sugar cane field is present to the north.
- b. Kissimmee River Site. The area for the exploratory well is in a disturbed/weedy area adjacent to a small canal that connects to Lemkin Creek and Eagle Bay. The intake pump and injection well will be along the Kissimmee River north of Route 78. It is

approximately 3 acres in size. The area is bounded by mobile homes to the south and pasture to the north.

- c. Moore Haven Site. The area for the exploratory well, injection well, and intake pump is between the C-43 Canal and the lock access road. It is approximately 2 acres in size. It is a sandy, disturbed area dominated by Brazilian pepper and a few cabbage palms.

Surface water will be used as the source of water for this pilot project. The District is currently conducting source water quality characterization tests on canal and river water that would be pumped into the ASR well. The Lake Okeechobee ASR Pilot Project began exploratory well construction in 2001 and will end with pump station construction in mid 2006. Cycle testing would be completed in 2008. Each site for the ASR Pilot Project is anticipated to consist of the following components:

- a. one exploratory well and one injection well extending into the Floridan Aquifer System, with an anticipated capacity of 5 mgd with ultrafiltration and chlorination for pre-treatment, and aeration for post-treatment;
- b. a source water collection system that will supply surface water to the ASR system. The source water will depend on geotechnical investigations and water quality testing to be conducted early in the pilot project implementation.
- c. a source water treatment facility;
- d. piping between the source water collection system, ASR wells, and discharge point(s);
- e. surface facilities (*e.g.*, pumps, valves, meters, instrumentation, etc.) to operate and monitor the system; and, 6 associated monitoring wells (Floridan Aquifer System and Surficial Aquifer System).

Initial effects analysis for the Lake Okeechobee ASR Pilot Project

The installation/operation of the three Lake Okeechobee ASR pilot wells has the potential to affect the following federally listed species: West Indian manatee, wood stork, bald eagle, Audubon's crested caracara, eastern indigo snake, snail kite, and Okeechobee gourd.

West Indian manatee

West Indian manatees are known to occur in the Kissimmee River, C-44, and C-43. According to the Service's database, 20 manatee mortalities have occurred near the pilot project site locations. Most of these were associated with the locks between the lake and the C-44 and C-43 canals. Since the scope of construction for this pilot project is limited (a very small footprint), it is unlikely that there would be any direct construction-related effects to this species. There is a

small chance the manatees might be encountered during construction of the intake pump stations (including potential offloading of equipment from barges, for example). Implementation of the Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* including the presence of a manatee observer should eliminate any possibility of take during construction.

The operation of pumps may affect manatees through entrapment and drowning. However, the implementation of manatee exclusion devices at the pump stations should eliminate the possibility of take during pump operation.

The subsequent discharge of ASR water following recovery could also adversely affect manatees. At this time, the maximum amount of discharge from any one of the pilot wells is 5 mgd. It is likely that this discharge would be diluted and should not pose a threat (based on poor water quality) to manatees. Additionally the Florida DEP will provide discharge criteria for all ASR effluents for the protection of fish and other aquatic life. There is the possibility of thermal effects within the discharge plume – the water is likely to be colder than the ambient surface water. This concern should be addressed for all ASR wells. At this time, it is difficult to estimate the size of the discharge plume and the resulting thermal changes (due to site specific characteristics this will be different for all ASR discharges). An analysis of the anticipated discharge timing (presumably during droughts and the dry season) and the seasonal occurrence of manatees in the project area would facilitate determination of effect. Current aerial surveys for manatees do not include the lake area. Additional occurrence data may need to be collected to estimate this type of effect.

Wood stork

According to the Service's database, there is one wood stork colony 17.7 miles from the Kissimmee River Site. This is just within the wood stork CFA of 18.6 miles. It is located in St. Lucie County on the Cypress Creek Parcel. Wood storks were observed along a canal near the Kissimmee River Site during a recent site inspection (February 2003). However, no work is proposed in or along this canal, therefore there should be no loss of foraging habitat within the CFA. No additional data indicate wood stork usage at the other two pilot project sites; however, the Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning.

Bald eagle

According to the Service's database, there are many bald eagle nests around Lake Okeechobee. However, none of the project sites are within either the Primary Zone (700 feet) or the Secondary Zone (1500 feet) of an eagle nest. Bald eagles could be encountered during construction. During a recent site visit (May 9, 2002) to the Port Mayaca Site, Service biologists

observed a bald eagle flying over the C-44 towards Lake Okeechobee adjacent to the proposed well area. After catching a fish from the canal, the eagle flew off in an east-northeast direction. The Service has no specific guidelines to reduce take to a foraging eagle, however project managers and construction crews should be aware of the potential presence and the potential for disturbing a foraging or roosting eagle. A recommendation would be to monitor the site for bald eagles during construction activities. If observed, the Service should be alerted and a determination would be made as to the severity of the effect. If determined to be an adverse effect, consultation would be reinitiated, if appropriate. To reduce potential effects to bald eagles during construction, for new or as yet undiscovered nests, the Service's *Habitat Management Guidelines for the Bald Eagle in the Southeast Region* should be consulted during project planning.

Also, there is the possibility that new electrical lines will need to be installed near open water to service new pumps. The publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

Caracara

Lake Okeechobee occupies the center of the caracara's distribution. According to the Service's database, numerous observations and nests occur north and west of the lake. The area around the Kissimmee River site has the highest number of occurrence records. No nests have been reported within 6,600 feet of the site. Twenty-one observations were recorded within 6,600 feet, and one of these was within 985 feet of the site. No nests and only one caracara observation were recorded within 6,600 feet of the Moore Haven Site. No caracara nests or observations were recorded within 6,600 feet of the Port Mayaca Site.

Although no nesting has been reported, foraging and/or roosting caracaras are likely to be encountered very close to the Kissimmee River site. The Service has no specific guidelines to reduce take to a foraging caracara, however project managers and construction crews should be aware of their potential presence and the potential for disturbing a foraging or roosting caracara. A recommendation would be to monitor the site during construction activities for caracara. If observed, the Service should be alerted and a determination would be made as to the severity of the effect. If determined to be an adverse effect, consultation would be reinitiated, if appropriate. To reduce potential effects to caracaras during construction, for new or as yet undiscovered nests, the Service's *Habitat Management Guidelines For Audubon's Crested Caracara In Central and Southern Florida* should be consulted during project planning.

Eastern indigo snake

There is a potential for eastern indigo snakes to inhabit the project area. Due to the widespread distribution and vast array of habitats that Eastern indigo snakes will utilize, it was assumed that the entire project footprint was potential Eastern indigo snake habitat (9.5 acres). Under worst-

case scenario, most of the total acres could be converted to unusable habitat (for water treatment facilities and wells/pumps). Given that this project has a very small footprint and the relative scarcity of this species, it was determined that Eastern indigo snakes are not likely be adversely affected by construction or operation. However, installation of additional access roads and associated vehicular use could increase the risk of harm to indigo snakes. Since indigo snakes could be encountered, the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Everglade snail kite

Critical habitat for snail kite is present within the lake near the Moore Haven site. However, since this pilot project does not propose any activities inside of the lake, or within 1500 feet of snail kite nests, we expect no adverse effect on this species or its habitat from this project.

Okeechobee Gourd

According to the Service's database, the Okeechobee gourd can be found within and around the littoral zone of the western shore of Lake Okeechobee. This project does not propose any work inside the Herbert Hoover Dike, therefore adverse effect on this species is not anticipated. Of the three pilot sites, the Moore Haven site is the closest to the lake shoreline and as such, has the greatest likelihood of effecting this species habitat. If the gourd is found at project sites in the future, the Service should be notified and then determine if reinitiation of consultation is necessary.

Coordination with Corps and The District for the Lake Okeechobee ASR Pilot Project

Most coordination on ASR projects has been done for all ASR projects collectively. No separate coordination was done for this project description and analysis. Coordination on other ASR projects covered the same issues and analysis methods.

Section 7 consultation

On July 27, 2001, the Corps requested concurrence on the installation of monitoring and exploratory wells at three sites around Lake Okeechobee for the Lake Okeechobee ASR Pilot Project. On August 8, 2001, the Service concurred with the Corps determination that those activities and the Hillsboro ASR pilot installation activities were not likely to adversely affect listed species or adversely modify critical habitat. The species evaluated were West Indian manatee, snail kite, and Audubon's crested caracara.

On October 10, 2001, the Service sent an email to the Corps that discussed both agencies' responsibilities under the ESA and the FWCA. The email also indicated the Service's concerns and recommendations for the entire ASR Project (regional and pilots). Topics of concern included water quality and biological monitoring, characterization of existing

ecological conditions, contaminants evaluation (during land acquisition) for the protection of Service trust resources, implementation of standard construction precautions/practices (specifically for West Indian manatee, bald eagle, and eastern indigo snake), monitoring of adverse construction effects on trust resources, exotic and invasive species control, loss of fish and wildlife habitat, water reservations, and effects of pumps on fishery and other aquatic resources.

On May 9, 2002, Corps, Service, and U.S. Environmental Protection Agency personnel conducted an onsite investigation of the locations identified for well construction for the Lake Okeechobee ASR Pilot Project.

On June 3, 2002, the Service received a phone call from the Corps requesting clarification on the activities related to well installation that would require manatee standard construction precautions. The Service responded by email as follows: Standard construction precautions for the protection of manatees will be necessary for this project only when the water bodies that they inhabit are being, or are potentially being, affected. That is to say, any activity that occurs in the adjacent canals or other water bodies, or on the immediate shoreline, would require these precautions. Specifically, these activities could include construction, equipment mobilization, dredging, earth-moving, gravel placement, dock installation, and/or discharge of well water (or any other substance). Conversely, activities occurring in a completely upland area (or areas not potentially inhabited by manatees) would not require the standard construction precautions for the protection of manatees. This would include the actual drilling of the well.

On June 6, 2002, the Service issued a PAL to the Corps for the Lake Okeechobee ASR Pilot Project. The Service concluded that, “the installation/operation of all of the Lake Okeechobee ASR wells have the potential to adversely affect the following federally listed species: West Indian manatee, eastern indigo snake, Audubon’s crested caracara, and bald eagle. Therefore, the Service recommends that standard protection measures, construction precautions, standard local operation procedures, and/or habitat management guidelines be implemented for these species and any other relevant federally listed species during the construction and operation phases for all components of the project to avoid any adverse effects on such species. Any new intakes or canals that are constructed, or existing canals that are widened, as part of this project that are hydraulically connected to any other water bodies inhabited by, or capable to be inhabited by, manatees, must have barriers to prohibit manatee movement into newly constructed or widened canal reaches. If properly designed, such barriers will ensure that Lake Okeechobee ASR Project facilities will pose no additional threat of structure-caused mortality or injury, entrapment in culverts or canals, or any other form of take, as defined in the ESA.”

On June 26, 2002, an additional site inspection was conducted to evaluate ecological conditions at a potential replacement site for the original Kissimmee River location. Listed species concerns would not change with the adoption of the new site.

On November 12, 2002, the Corps issued an existing conditions document for the Lake Okeechobee ASR Pilot Project. The text relative to federally-listed species was as follows:

- a. Port Mayaca Site. Although the area is disturbed, the existing terrain could be attractive for the eastern indigo snake which is known to inhabit the area. Activities directly effecting the canal, such as placement of intake or discharge structures and gravel bed have the potential to effect the West Indian manatee. Therefore, standard manatee construction conditions and precautions for the eastern indigo snake should be taken at all phases of construction affecting these habitats. The Service has also identified the Audubon's crested caracara and bald eagle as possible users of the immediate area. On site inspection, both predatory birds were observed in the vicinity. For future planning, construction, and operation of a full-scale pilot project, standard construction conditions for the bald eagle and crested caracara should be implemented if the species are identified as inhabiting an area within the established range of the construction.
- b. Kissimmee River Site. The existing habitat is suitable for the Audubon's crested caracara. Bald eagle may occasionally use this or nearby areas providing that adequate perching or nesting trees are present. Therefore, surveys may need to be conducted during the nesting seasons for these two species. If nests are found, standard construction precautions may need to be implemented. The Service also indicated the site has potential to be occupied by the eastern indigo snake. Although specific information is unavailable at this time for the West Indian manatee in the Kissimmee River, they are present in the lake at the confluence, and therefore, could be present at this site. Activities directly impacting the river, such as placement of intake or discharge structures and gravel beds have the potential to effect the manatees. Therefore, standard manatee construction conditions and precautions for the eastern indigo snake should be taken at all phases of construction affecting these habitats.
- c. Moore Haven Site. Although the area is disturbed, the existing terrain could be attractive for the eastern indigo snake. Activities directly impacting the canal, such as placement of intake or discharge structures and gravel bed have the potential to effect the West Indian manatee. Therefore, standard manatee construction conditions and precautions for the eastern indigo snake should be taken at all phases of construction affecting these habitats. The Service has also identified the Audubon's crested caracara and bald eagle as possible users of the immediate area. For future planning, construction, and operation of a full-scale pilot project, standard construction conditions for the bald eagle and crested caracara should be implemented if the species are identified as inhabiting an area within the established range of the construction.

34 Hillsboro Aquifer Storage and Recovery Pilot

Hillsboro Aquifer Storage and Recovery Pilot Project description

The Hillsboro ASR Pilot Project was proposed to address the feasibility of using ASR technology to augment water supply and maintain operational canal stages. Originally, the ASR Pilot Project included a 50-acre impoundment for water supply. In November 2002 the impoundment was discontinued and the ASR Pilot Project became a stand alone CERP component. An associated project, the Site 1 Impoundment, will be a potential source of injected water. This project is in the early planning stages and alternatives have not yet been formulated. Therefore, this analysis is based on the information contained in the PMP.

Located along the Hillsboro canal in southern Palm Beach county (Fig. 34-1), the Hillsboro ASR Pilot Project consists of the following elements:

- a. one ASR well into the upper Floridan Aquifer System (Floridan Aquifer System), with an anticipated capacity of 5 mgd;
- b. a surface water collection system that will supply water to the ASR system;
- c. a pre-recharge water treatment facility (if necessary based on water quality tests);
- d. a pre-discharge water treatment facility (for recovered water prior to discharge into the canal or impoundment);
- e. pipes between the source water collection system, the ASR wells, and discharge points;
- f. surface facilities including pumps, valves, meters, and instrumentation necessary for operation and monitoring of the system; and
- g. associated monitoring wells in the Florida Aquifer System and Surficial Aquifer System.

Three wells have already been installed at the project site. Two are Floridan Aquifer System test wells and the third is the ASR well. The level of treatment required for injected and recovered water is yet to be determined. Therefore, the size and type of treatment facilities is not known. The footprint of the ASR wells is negligible and the maximum footprint of the surface treatment facilities would be approximately five acres (Rebecca Weiss, Corps, personal communication 2003).

Initial effects analysis for the Hillsboro Aquifer Storage and Recovery Pilot Project

Information regarding the habitat requirements and potential presence of threatened and endangered species was taken from the MSRP.

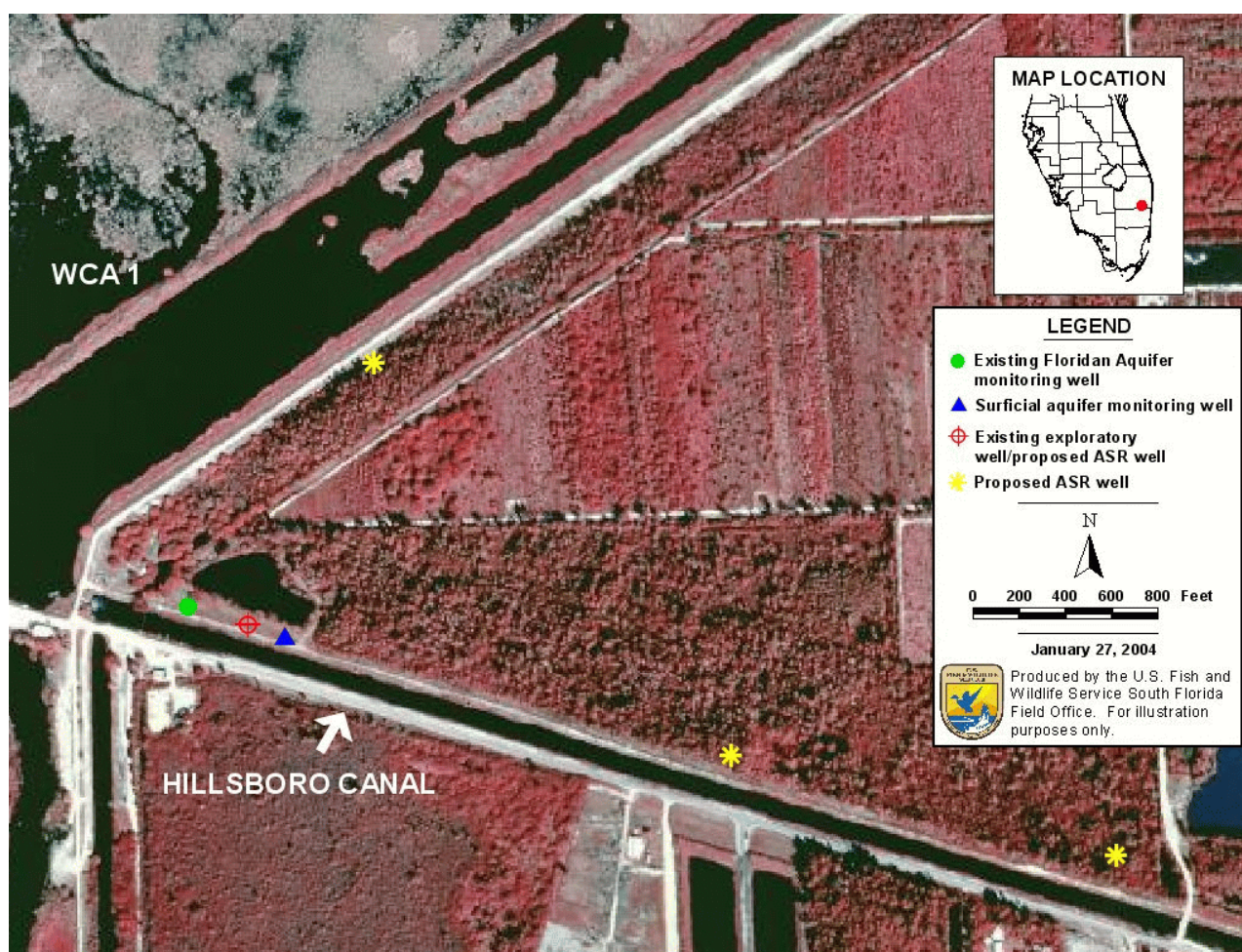


Figure 34-1. Hillsboro Aquifer Storage and Recovery Pilot Project site map.

Eastern indigo snake

Harm: Five acres of habitat will be taken with the construction of water treatment facilities. Indigo snakes may be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Coordination with Corps and The District

March 14, 2003, email from Rick Nevulis, District, to discuss project footprint.

March 17, 2003, telephone conversation with Steve Sutterfield, Corps, to discuss project features.

March 25, 2003, email from Glenn Landers, Corps.

March 25, 2003, telephone conversation with Rebecca Weiss, Corps, to discuss treatment facility size.

Section 7 consultation documents

June 13, 2002. PAL providing planning guidance.

January 14, 2003. Endangered species letter and list.

August 8, 2001. Service letter concurring with the Corps' no effect determinations on monitoring and exploratory well construction.

Lake Belt In-Ground Reservoir Technology Pilot Project description

The purpose of the Lake Belt Pilot Project is to determine whether the two full-scale Lake Belt Storage Area CERP components (Central and North Lake Belt Areas) can be successfully constructed and operated to supply environmental and water supply deliveries. Rock mining in northwest Miami-Dade County has created many large rock quarries at depths up to 80 feet. The CERP proposes to use these rock pits to store excess water. To put water in these rock pits without a seepage barrier around them would cause the water to enter the surficial groundwater aquifer system, causing a rise in the water table and flooding impacts. Drawing water from these areas without a seepage barrier would impact well fields, drain adjacent wetlands, and increase seepage from the WCAs to the west. The pilot project is required to determine construction technologies, storage efficiencies, impacts on local hydrology, and water quality effects in a geologic setting similar to the geology at the proposed locations for the full-scale in-ground reservoir sites. There are additional concerns involving the geology beneath the proposed storage areas and whether rock-mining practices (blasting) will impact performance of the barrier. Water quality assessments would include a determination as to whether the in-ground reservoirs and seepage barriers will allow for storage of untreated waters without concern for groundwater contamination. The pilot project as currently documented would consist of the following components: (1) preparation of a pilot project design report that would recommend a technology and a site as well as design documentation, (2) preparation of plans and specifications, (3) acquisition or lease of required lands, (4) construction of cells to test one or more technologies and depths and construction of the pilot scale in-ground reservoir including pumps or intake and outfall structures, (5) a project monitoring program, and (6) a pilot project technical data report.

Planning for the pilot project has reached the point of developing barrier wall technology, developing criteria for ranking sites by fatal flaws, and phase 1 screening. Phase 1 screening and coordination with rock mining companies has resulted in the elimination of existing limestone mining pits as candidates for pilot project implementation. Emphasis has now shifted to selection of a pilot project site that would involve excavation of a new pit or enhancement of an existing small borrow pit. Figure 35-1 details the locations currently under consideration for the pilot project.

Project footprint

An estimated worst-case scenario based on the Lake Belt PDT Phase II Qualitative and Quantitative Site Selection Criteria (criteria) estimates that an approximately 102-acre parcel would be required to construct the maximum size pilot project reservoir (assuming a 50-foot wide construction corridor and pumps or intake and outfall structures). Screening of sites using the criteria has now resulted in selection of the Stairstep North site for pilot project implementation (Fig. 35-1). Figure 35-2 details vegetative cover types associated with this location. The Stairstep North site is located within dense (75 to 100 percent) melaleuca forest and disturbed prairie with 50 to 75 percent melaleuca cover types.

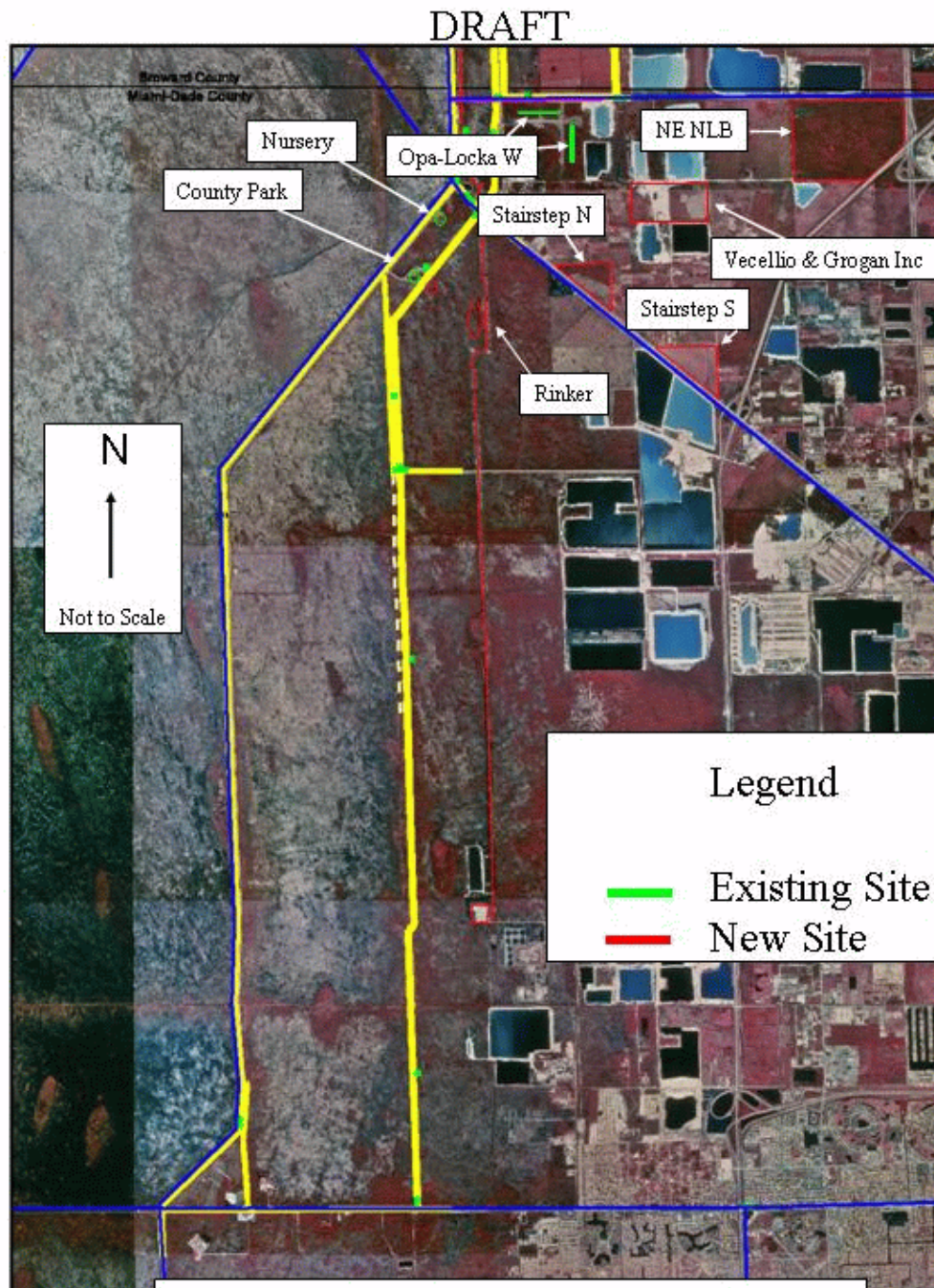


Figure 35-1. Location of sites considered for the Lake Belt Pilot Project
 (<http://www.evergladesplan.org/pm/projects/docs_35_lake_belt_pilot.cfm>).

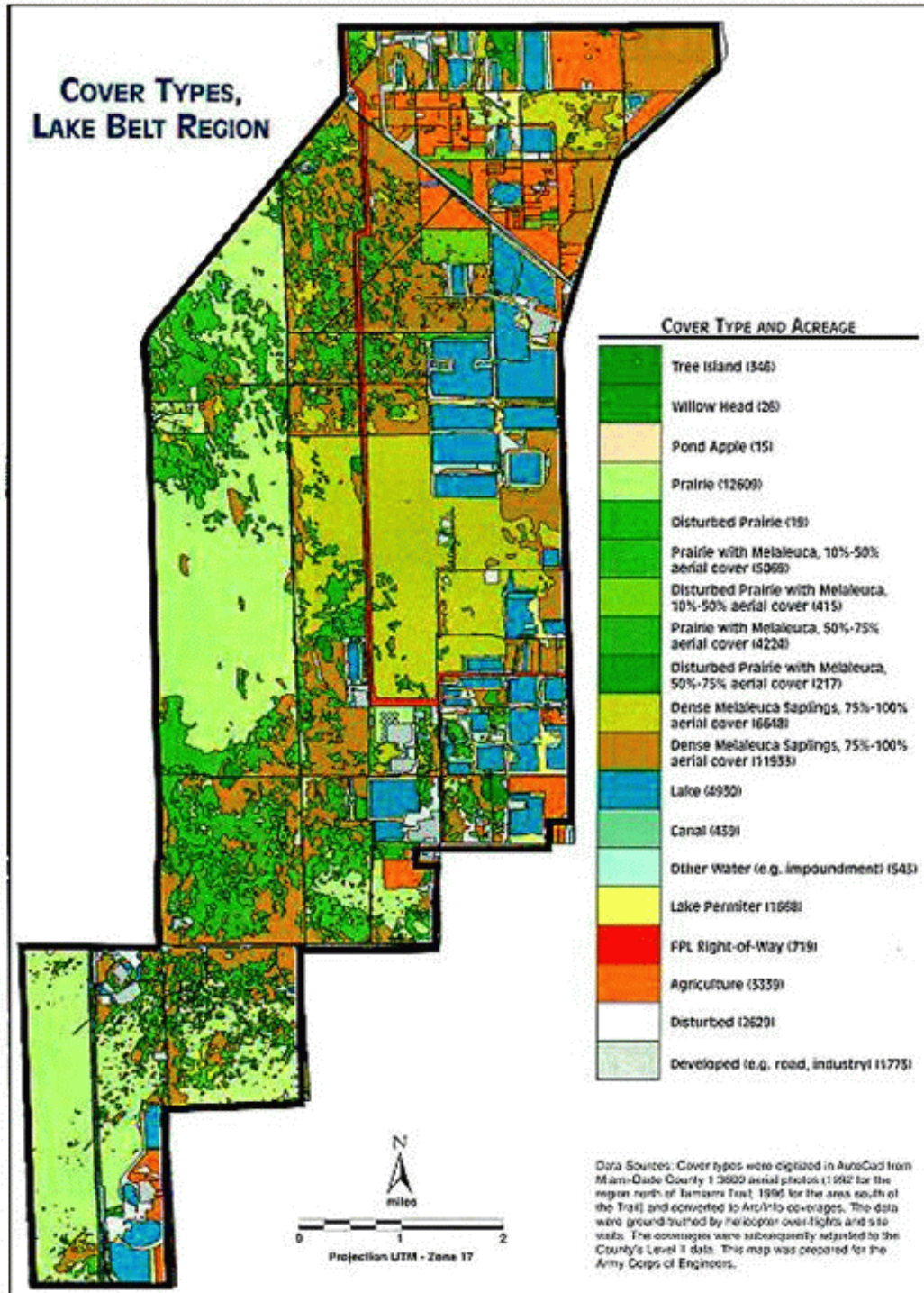


Figure 35-2. Vegetation cover types in the Lake Belt Area
(<http://www.sfwmd.gov/org/pld/proj/lakebelt/maps.htm>; District 2003).

Initial effects analysis for the Lake Belt In-Ground Reservoir Technology Pilot Project

At this point in the planning process, it is difficult to provide detailed comments on threatened or endangered species issues or on other wildlife and environmental issues. Our comments are therefore more general in nature at this point, and will be developed in greater detail as the process is completed in the form of additional PALs and a FWCA Report, as well as the required consultation under the ESA. Additional planning is essential once the pilot project technology is selected.

Wood stork

The Stairstep North site is within the maximum 18.6-mile CFA of documented wood stork nesting colonies outside the project area, but is marginal foraging habitat for wood storks. The Dade County Lake Belt Plan: Wildlife Study (Dalrymple and Dalrymple, 1996) recorded only one observation of wood stork use over a 24-month period in 50 to 75 percent melaleuca cover type. Wetlands with melaleuca cover over 50 percent are not considered suitable habitat for wood storks. The footprint of the 102-acre parcel that would be required to construct the maximum size pilot project reservoir would have no effect on wood storks. If 100-foot wide littoral shelves (similar to those currently required as part of mitigation for Lake Belt mining) are constructed on the periphery of the excavation as part of pilot project implementation, then 15 acres of potential foraging habitat could be created depending on operational guidelines developed for the project. Additional habitat could be created by implementing further wildlife enhancements. Since littoral shelves are not currently part of the project plans, no new foraging habitat will be tallied for this report.

Everglade snail kite

No designated critical habitat for the snail kite is found within Stairstep North. Likewise, there is no documentation of any nesting or foraging activity by snail kites. The habitat types associated with the pilot project site location (dense [75 to 100 percent] melaleuca forest and disturbed prairie with 50 to 75 percent melaleuca) are not utilized by snail kites. Snail kite foraging habitat is in areas with sparse vegetation and is concentrated along boundaries of various emergent macrophytes. In general, foraging areas are shallow and provide an emergent stem density sufficiently sparse to enable snail kites to see their prey, yet dense enough to provide an emergent substrate for snails concentrating at or near the surface in numbers that attract foraging birds (Kitchens et al. 2002).

Construction of the Lake Belt Pilot Project would convert approximately 102 acres of existing dense (75 to 100 percent) melaleuca forest or disturbed prairie with 50 to 75 percent melaleuca to 59 acres of deeper, open-water habitat and 43 acres of grassland, shrub, or forested habitat, neither of which is suitable for snail kite foraging. If 100-foot wide littoral shelves are constructed on the periphery of the excavation along the shoreline (maximum perimeter of approximately 6,400 feet) as part of pilot project implementation a 6-foot strip of habitat suitable

for snail kite foraging would be created, thereby resulting in a total of 1 acre that could be created depending on operational guidelines developed for the project. Additional habitat could be created by implementing further wildlife enhancements. Since littoral shelves are not currently part of the project plans, no new foraging habitat will be tallied for this report.

Eastern indigo snake

All the Stairstep North site can be considered suitable eastern indigo snake habitat. Construction of the worst case scenario reservoir would effect 102 acres of existing dense (75 to 100 percent) melaleuca forest or disturbed prairie with 50 to 75 percent melaleuca, all considered suitable habitat for eastern indigo snakes. The deeper, open-water habitat created as part of the potential project could be up to 59 acres and is not suitable as indigo snake habitat. The remaining 43 acres of the project perimeter would be restored to grassland, shrub, or forested habitat that would eventually be acceptable habitat for indigo snakes. Additional habitat could be created by implementing further wildlife enhancements. Indigo snakes could be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Bald eagle

No bald eagle nesting activity has been recorded in the Stairstep North site. The habitat types associated with this project (dense [75 to 100 percent] melaleuca forest or disturbed prairie with 50 to 75 percent melaleuca) are not considered suitable habitat for bald eagles. Creation of the pilot project reservoir would not result in positive habitat changes for bald eagles because the vertical sides and deep depths of the pilot project reservoir would not create significant habitat for fish. If 100-foot wide littoral shelves (similar to those currently required as part of mitigation for Lake Belt mining) are constructed on the periphery of the excavation as part of pilot project implementation, then 15 acres of potential foraging habitat could be created depending on operational guidelines developed for the project and the availability of suitable perch and nest sites. Additional habitat could be created by implementing further wildlife enhancements. Since littoral shelves are not currently part of the project plans, no new foraging habitat will be tallied for this report.

New electrical lines would be needed associated with the installation of pumps near open water. The publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

West Indian manatee

The footprint of construction of the Lake Belt Pilot Project at the Stairstep North site would have no effect on the West Indian manatee except possibly at the location of new pumps, intakes, and outfall structures constructed for the pilot on either the C-6 or C-9 canals. Manatees have been documented in the lower reaches of many canals connected with the C-6 and C-9 canals nearer

to Biscayne Bay, and occasionally have been documented as far upstream as the Stairstep North site. Mortality or disturbance could result from construction and operation of new pumps, intakes, and outfall structures. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during project construction to ensure minimal or no disturbance to manatees during construction. Installation and operation of manatee exclusion devices at water control structures should minimize the possibility of take during pump operation. A multi-agency team is developing additional guidance for structure design and manatee access.

Coordination with the Corps and the District for the Lake Belt In-Ground Reservoir Technology Pilot Project

January 16, 2002. PDT meeting.

January 23, 2002. Service comments on January 2 draft PMP.

July 25, 2002. PDT meeting.

October 21, 2002. E-Mail: Service comments on site and technology evaluation criteria.

December 18, 2002. Lake Belt PDT site visit and evaluation.

January 28, 2003. PDT meeting.

February 3, 2003. E-mail, comments on fatal flaw site selection ranking criteria phase 2.

March 18, 2003. E-mail, coordination of project description.

March 26, 2003. PDT meeting.

April 15, 2003. Draft recommendations for recreational opportunities and constraints.

April 29, 2003. E-mail, Lake Belt phase 2 siting criteria.

April 30, 2003. South Miami Dade PDT Workshop.

May 19, 2003. Lake Belt Pilot Project candidate site field visit and evaluation.

May 27, 2003. PDT meeting.

July 14, 2003. Planning Aid Report for the Lake Belt In-Ground Reservoir Technology Pilot Project, Miami-Dade County, Florida.

July 29, 2003. Lake Belt public workshop.

Section 7 consultation documents

July 14, 2003. Planning Aid Report for the Lake Belt In-Ground Reservoir Technology Pilot Project, Miami-Dade County, Florida. Includes response to the Corps' 5/22/03 request for a list of threatened or endangered species or their critical habitat that may be present in the project vicinity.

L-31N Seepage Management Pilot Project description

The purpose of this project is to investigate seepage management technologies to control seepage from ENP. The pilot project will provide necessary information to determine the appropriate amount of wet-season groundwater flow to return to ENP while minimizing potential impacts to Miami-Dade County's West Well field and freshwater flows to Biscayne Bay. Technologies to be tested may include reducing levee seepage flow across L- 31N adjacent to ENP via a levee cutoff wall; or reducing groundwater flows during the wet season by capturing the groundwater with a series of wells adjacent to L-31N, then back pumping those flows to ENP. Other technologies may also be explored, such as those reviewed and described in the Technical Advisory Report on Seepage Management (Technical Advisory Committee 1997).

The benefits of this project should include the determination of construction technologies, impacts on local hydrology, and impacts on local water quality of a given technology. Additionally, the data collected from the pilot project will be used to calibrate a regional model that would improve the understanding of the regional impacts of seepage management used at a larger scale. Tamiami Trail defines the pilot project study area boundary along the L-31N canal area to the north and G-211 defines it to the south (Fig. 35-1). Based on the results of a screening matrix developed by the PDT that included such criteria as feasibility, compatibility with geology, right-of-way requirements, operation and maintenance, reversibility, environmental effects, and others, a list of 12 seepage management technologies have currently been selected for further detailed evaluation.

- a. Interlocking sheet pile or pipe pile wall.
- b. Driven piles in an overlapping pattern.
- c. Slurry trenched wall with self-hardening slurry.
- d. Slurry trenched wall with self-hardening slurry and high-density polyethylene liner.
- e. Open trench backfilled with low-permeability material.
- f. Shallow seepage recovery wells.
- g. Shallow seepage-collection trench.
- h. Lining on slopes and bottom of a canal.
- i. Collection trench at the toe of a levee.
- j. Backpumping water into the Everglades.
- k. Aquifer storage and recovery.
- l. Relocate L-31N to east of Krome Avenue.

Project footprint

The diversity of the potential technologies yet to be evaluated makes it difficult to assess potential effects on threatened or endangered species. No decision has been made at this time on

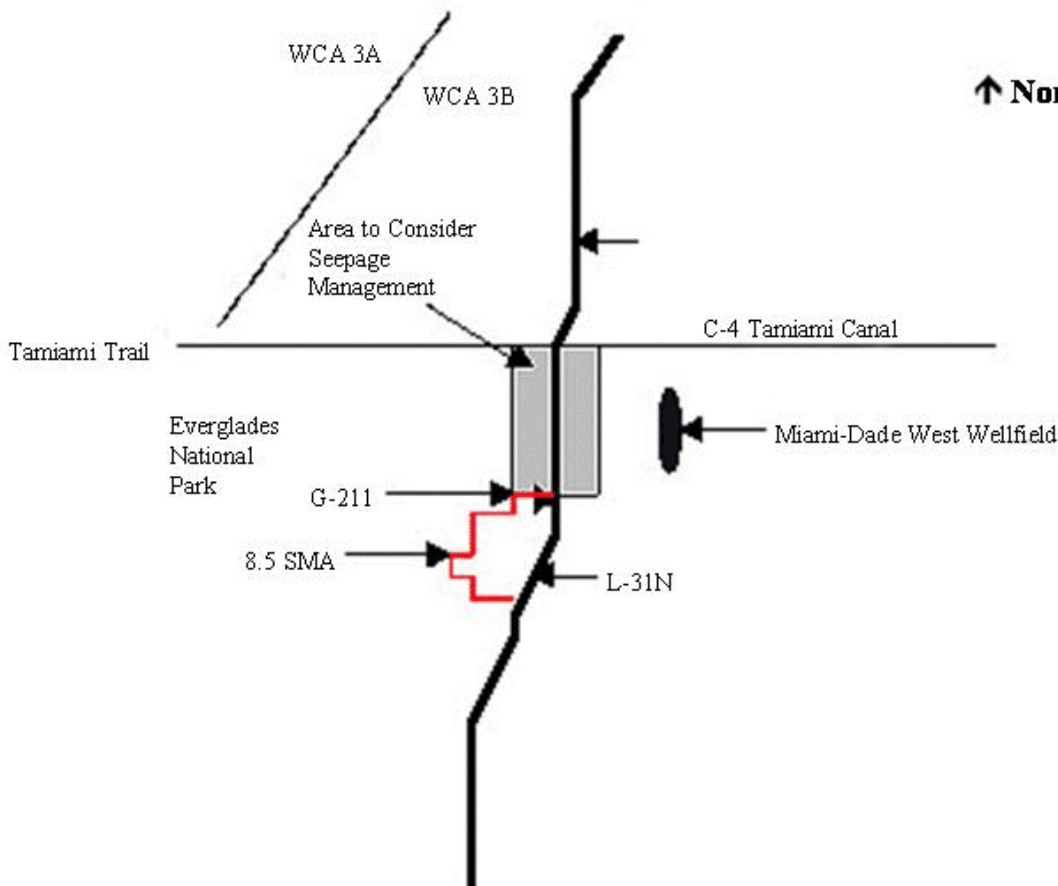


Figure 36-1. L-31N Seepage Management Pilot Project area map (Figure 1; Corps 2002).

the final location of the seepage management pilot or the size of its footprint. For this analysis, the project footprint will be considered in a worst-case scenario including an estimated 1-mile length (within the boundary described above) of the immediate levee and levee toe and access area (approximately 100 feet in width) on which the seepage technology may be constructed.

Initial effects analysis for the L31N Seepage Management Pilot Project

At this point in the planning process, it is difficult to provide detailed comments on threatened or endangered species issues or on other wildlife and environmental issues. Our comments are therefore more general in nature at this point, and will be developed in greater detail as the process is completed in the form of additional PALs and a FWCA Report, as well as the required consultation under the ESA. Additional planning is essential once the pilot project technology and site are selected.

Wood stork

None of the footprint acres for the L-31N Seepage Management Pilot Project is within the Primary or Secondary Zones for known wood stork colonies. All of the footprint acres for the project is within the CFA of documented wood stork nesting colonies outside the project area. Since the levee and levee toe area to be effected is not suitable stork habitat, no effect is anticipated.

Everglade snail kite

No designated critical habitat or documented nesting sites for the snail kite are found within the L-31N Seepage Management Pilot Project footprint. The footprint of the L-31N Seepage Management Pilot Project includes only minimal foraging habitat for snail kites at water's edge and no adverse effect is anticipated.

Eastern indigo snake

All of the potential L-31N Pilot Project footprint can be considered suitable eastern indigo snake habitat. Construction of the worst-case scenario would temporarily effect a total of 12 acres of the immediate levee and levee toe access area with grass, forbs, small shrubs, and wetland plants, all considered suitable habitat for indigo snakes. Indigo snakes may be directly harmed or harassed during construction activities and road mortality could possibly occur if the levee is used for equipment access to the construction area. The Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Florida panther

The L-31N Seepage Management Pilot Project location footprint is within the designated Primary/Dispersal Zone for the Florida panther. The habitat type associated with this project (levee bank with grass, forbs, small shrubs, and wetland plant species) is considered high quality habitat for Florida panthers. Assuming some potential limited panther use may occur now or in the future in the pilot project area, the project could have a maximum potential effect of 12 acres associated with the footprint of the project during construction activities.

Bald eagle

No recent bald eagle nesting activity has been recorded in the L-31N Seepage Management Pilot Project footprint. The habitat types associated with the project footprint are not considered foraging habitat for bald eagles. If new electrical lines will be needed associated with the installation of pumps near open water or any other project features for the selected seepage management technology, the publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

West Indian manatee

Construction within the project footprint may effect the West Indian manatee at the location of any new pumps, intake pipes, and outfall structures constructed on the L-31N canal. Manatees have infrequently been documented moving into the L-31N canal, apparently through the Lake Okeechobee system by way of the L-33, L-30, and L-31N canals. Manatees have been documented in the lower reaches of many canals nearer to Biscayne Bay connected with L31N, and occasionally have been documented as far upstream as the potential project area. Mortality or disturbance could result from construction of new pumps, intake pipes, and outfall structures. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during project construction to ensure minimal or no disturbance to manatees during construction. Installation and operation of manatee exclusion devices at water control structures should minimize the possibility of take during operation. A multi-agency team is developing additional guidance for structure design and manatee access.

Coordination for L31N Seepage Management Pilot project

January 22, 2002. Site visit and public meeting.
January 29, 2002. PDT meeting and site visit.
March 21, 2002. Letter: Change in schedule for PDT deliveries.
April 23, 2002. PDT meeting.
May 15, 2002. Work Schedule, Manpower and Budget Estimate documentation.
June 25, 2002. PDT meeting.
July 18, 2002. E-Mail: Service comments on technology screening criteria.
August 22, 2002. PAL: Service comments on L-31N Project and preliminary list of threatened and endangered species.
August 26, 2002. Teleconference.
August 26, 2002. E-Mail: Service comments on technology screening decision matrix.
September 12, 2002. Letter: Service comments on the Corps' August 19, 2002, National Environmental Policy Act scoping letter.
November 15, 2002. PDT meeting.
November 19, 2002. PDT meeting.
December 3, 2002. PDT meeting.
December 13, 2002. PDT site visit.
March 18, 2003. E-Mail: Coordination of L-31N Seepage Management Pilot project description.
March 27, 2003. PDT Meeting.
May 16, 2003. PDT Video-teleconference.
August 21, 2003. PDT meeting.
September 3, 2003. L-31N Stakeholders meeting and public information workshop.

Section 7 consultation history for L31N Seepage Management Pilot
No Section 7 consultation has occurred to date on this project.

Wastewater Reuse Technology Project description

The Restudy identified a water supply shortfall estimated at 100 mgd in the C-111 and lower east coast areas as future CERP components are implemented. In order to offset this water deficit, the Restudy evaluated the use of highly treated wastewater as a method to provide additional quantities of water. However, additional questions need to be answered before reuse can become a viable alternative. Several critical issues are water quality, advanced treatment technologies, and possible effects of using reclaimed water on natural systems. The primary purpose of the Wastewater Reuse Technology Pilot Project is to determine the ecological effects of using advanced treated reclaimed water to replace and augment freshwater flows to various natural areas, including Bird Drive Recharge Area, estuarine wetlands, and Biscayne Bay; and to determine the level of treatment required to prevent degradation of the receiving wetlands.

This project as originally designed, consisted of two separate parts, a west Miami-Dade County Reuse component and a south Miami-Dade County Reuse component. It has since been determined by the PDT that these two parts should be rolled into one project, the Wastewater Reuse Technology Pilot Project. This was done in order to avoid duplication of effort between the two parts, which share a number of similar tasks.

Land is available within the South Miami-Dade Wastewater Treatment Plant (Treatment Plant) facility for construction of the advanced wastewater treatment plant. However, the test cells will have to be located on other undeveloped sites since there would be no room for these at the existing treatment facility. A preliminary real estate analysis conducted by the Corps identified seven potential sites where the test cells may be located (Fig. 37-1). A site-selection matrix is currently being drafted by the PDT's ecological sub-team for use by the PDT in evaluating each site and ultimately selecting the most appropriate site for discharge of reuse water. The matrix will contain upwards of 30 or more selection criteria in several groups including real estate, regulatory factors, engineering and geotechnical factors, environmental considerations, and socioeconomic impacts. These criteria will be scored for each site with a -1 if the factor is negative, a 0 if the factor is neutral, and a +1 if the factor is positive.

For the purposes of this analysis it is assumed that the test cells will be located on Site 2, a county-owned parcel of land just east of the Treatment Plant (Fig. 37-1, tract 500-030). This location has the greatest potential to effect threatened and endangered species and affect a wider range of habitats (*e.g.*, the site is tidally connected to Biscayne Bay). It has been suggested that the test cells be constructed on land located to the west of the treatment plant in order to incorporate more treatment as the water flows through adjacent coastal wetlands before entering Biscayne Bay, which is classified as an Outstanding Florida Water. In all likelihood, this would be the case should a full-scale reuse project be implemented to rehydrate the Biscayne Bay Coastal Wetlands.



Figure 37-1. Map of Wastewater Reuse Technology Pilot, West Miami-Dade Reuse, and South Miami-Dade Reuse Project areas showing proposed test cell sites (Figure prepared by Miami-Dade Department of Environmental Resource Management).

Project footprint

On April 2, 2003, an ecological sub-team, consisting of biologists representing the Miami-Dade Department of Environmental Resource Management, Corps, and the Service conducted a preliminary assessment of six wetland sites adjacent to the South District Wastewater Treatment Facility (site 7 has been added since this survey) (Fig. 37-1). The survey focused on a characterization of the vegetative cover and associated soil types, with a discussion of the hydrology and potential wildlife usage within those areas. This evaluation, supplemented with an Hazardous, Toxic, and Radioactive Waste review, an analysis of the hydraulics, hydrology, geotechnical, and real estate assessment, along with logistical constraints, can be used towards

providing a functional and qualitative ranking of the wetland sites presently considered as candidates for the selection of a test and control cell for the pilot project.

Site 2 is characterized as an estuarine system tidally connected to Biscayne Bay. This site, according to real color aerials, is classified as scrub shrub and is for the most part densely forested with a mangrove canopy. The water regime is undetermined at this time but is most likely irregularly flooded. The water chemistry is also undetermined but is likely mixohaline. The soil at this site is classified as mineral.

This site was accessed from SW 232 Street east of Galloway Road. The team walked along a north-south trail that ran along an old mosquito ditch that is parallel to Galloway Road and near the western boundary of the tract. The site consists primarily of saline vegetation and marl soils (Perrine Marl, Tidal, according to the Soil Survey of Dade County, Florida). Uprooted and partially decomposing trees scattered through the site probably date from Hurricane Andrew. Uprooted trees were replaced, but many trees in this area that snapped off did survive. Red mangroves cannot survive extreme damage of that type, so they were likely small enough to survive or were replaced by red mangrove seedlings already in place or delivered to the area by the summer of 1993, while white and black mangroves either survived because they were small or likely resprouted from damaged trunks.

The dominant vegetation is white mangrove intermixed with buttonwood. Other subordinate species include red and black mangrove, leather fern, saltbush, sea oxeye daisy, and a peripheral growth of Brazilian pepper. Australian pines were observed growing on spoil mounds left from construction of mosquito ditches much earlier in the century. Wildlife usage was not well documented due to time constraints, but includes the night heron. The terrain is littered with numerous coastal land crab and fiddler crab holes. Again, this site is not favorable for use in the project due to the dominance of native plants and direct tidal connection to Biscayne Bay, as indicated by dominance of halophytic species and presence of mosquito ditches.

As envisioned at this time, two 15-acre test cells would be constructed in the tidally influenced dwarf mangrove ecosystem located just east of the Treatment Plant (Fig. 37-2). These test cell size requirements are based on a rough estimate of the minimum area needed to meet the regulatory hydraulic loading rate requirement not to exceed 6 inches per week. One cell will be used for evaluating effects of reclaimed water while the other will be used as a control cell for comparison. The cells will remain naturally vegetated; however, berms would need to be constructed around the cells to retain reclaimed water. Approximately 1,558 yards of levee would encompass each cell, creating 1.4 acres of upland habitat per cell (2.8 acres total). A supply pipe and distribution header would connect the treatment plant and test cells and would be placed under SW 87 Avenue. Test-cell effluent would enter a collection canal and be circulated back to the treatment plant.



Figure 37-2. Color infra-red aerial photograph of the Wastewater Reuse Technology Pilot, West Miami-Dade Reuse, and South Miami-Dade Reuse Project areas.

Initial effects analysis for the Wastewater Reuse Technology Project

Wood stork

The wastewater reuse project area is suitable foraging habitat for wood storks and lies within the 18.6-mile CFA of documented nesting colonies on the eastern end of Tamiami Trail. At this time no operational criteria have been set forth for the test cells. Wood stork usage of the test cells will depend largely on the depth of water maintained within the cells and potential drydowns that concentrate prey. Depending on how these impoundments are managed, they could provide 30 acres of improved foraging habitat for wood storks. Conversely, canopy density may inhibit storks from using the test cells. In order to provide a conservative analysis, we have assumed that the test cells will not provide suitable habitat.

A potential adverse effect would be the conversion of 2.8 acres of foraging habitat to upland levees. The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning.

Eastern indigo snake

The wastewater reuse technology pilot project area footprint could be suitable habitat for eastern indigo snakes. Construction of berms would benefit the eastern indigo snake by providing 2.8 acres of upland habitat adjacent to the flooded mangrove test cells. However, indigo snakes may be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

American crocodile

Critical habitat designated for the American crocodile extends from the middle Florida Keys north to Turkey Point, which is 8 miles south of the proposed project area. Construction of the wastewater reuse pilot project may attract crocodiles to the 2.8 acres of berm, which could possibly provide suitable nesting habitat. Crocodiles have been documented utilizing the cooling canals of the Turkey Point Power Plant as nesting sites and have been known to travel significant distances inland, especially through freshwater tributaries to less saline waters. Road mortality is a major concern with adult and subadult crocodiles, and the proposed action may attract animals further inland toward roads. If at all possible, berms should be constructed parallel to roadways to deter crocodiles from entering or crossing roadways.

Coordination with Corps and the District for the Wastewater Reuse Technology Project

The Service has been an active participant in all phases of the Wastewater Reuse Technology Pilot Project, PDT process. Service biologists have made presentations on the Service's role in the proposed plan including recommendations for improving the content and analyses leading to PALs and FWCA Reports. The Service has assumed the lead role on several tasks dealing with the site characterizations and selection matrix.

November 19, 2001. Public meeting.

December 14, 2001. Teleconference w/ Kimley-Horn.

February 20, 2002. Site visit to Bird Drive Recharge Area.

February 21, 2002. Transferability Conference.

April 26, 2002. South portion PDT kickoff.

June 11, 2002. PDT/Public meeting.

August 09, 2002. PDT meeting.

February 7, 2003. Water Quality joint C-111/Biscayne Bay/Reuse sub-team meeting.

February 25, 2003. PDT meeting.

March 2, 2003. Site visit.

Section 7 consultation documents

Several PALs relaying technical assistance have been provided and a regional species list was provided to the Corps. Formal section 7 consultation has not been initiated.

Acme Basin B Discharge Project description

Information included in the following description was gathered, in part, from the March 2003 Acme Basin B Discharge Project (Acme Project) preliminary draft PMP (Corps 2003c).

The primary purpose of the Acme Project is to provide Acme Basin B water to the Loxahatchee Refuge, also known as WCA 1, which consists of approximately 146,000 acres. The Loxahatchee Refuge is the remaining portion of the northern Everglades ecosystem, and is part of the Everglades Protection Area.

Acme Basin B is one of two primary drainage basins within the Acme Improvement District, a dependent district to the Village of Wellington in central Palm Beach County, Florida (Fig. 38-1). Acme Basin A is located north of Acme Basin B. Acme Basin B encompasses approximately 8,680 acres of low density development with rural residential areas, plant nurseries, and a large number of equestrian facilities. Currently, Acme Basin B nutrient-laden waters discharge directly into the Loxahatchee Refuge through two pump stations along the eastern side of the Loxahatchee Refuge.

Through the CERP process, it was determined that the most significant water supply benefit for Acme Basin B would be derived from discharging all stormwater runoff into the Loxahatchee Refuge for environmental water supply, provided that the water could be adequately treated. The flows must be in accordance with the 1994 Florida Everglades Forever Act. Best Management Practices have been employed by the Village of Wellington to partially reduce nutrient runoff from Acme Basin B.

According to the Restudy, this project would treat approximately 8,000 acre-feet per year of stormwater runoff from Acme Basin B via a wetland treatment area or chemical treatment facility. Under CERP, the Acme Basin B Discharge Project was originally included as a Group 1 component of the WPAs. An Acme Project design was included in the WPA Feasibility Study. According to the Preliminary Selected Plan, the Acme Project would include a 533-acre above-ground reservoir and a 357-acre STA with combined storage capacity of 5,700 acre-feet in an area northeast of the Loxahatchee Refuge. Five ASR injection wells would be located within the impoundment. Due to the high cost of this plan and reduced flows to the Loxahatchee Refuge from those currently being discharged from Acme Basin B, the Acme Project was reassigned as a separate CERP project to develop additional alternatives that were not considered in the WPA Feasibility Study. Provided that the water can be adequately treated, delivery of all stormwater runoff from Acme Basin B is desirable (approximately 32,000 acre-feet per year). A separate Environmental Impact Statement for the Acme Project will be developed in order to assess alternative designs that can provide similar or greater benefits to the natural system as shown in the CERP. Project cost cannot exceed \$25 million in order for the Acme Project to remain under Corps programmatic authority.

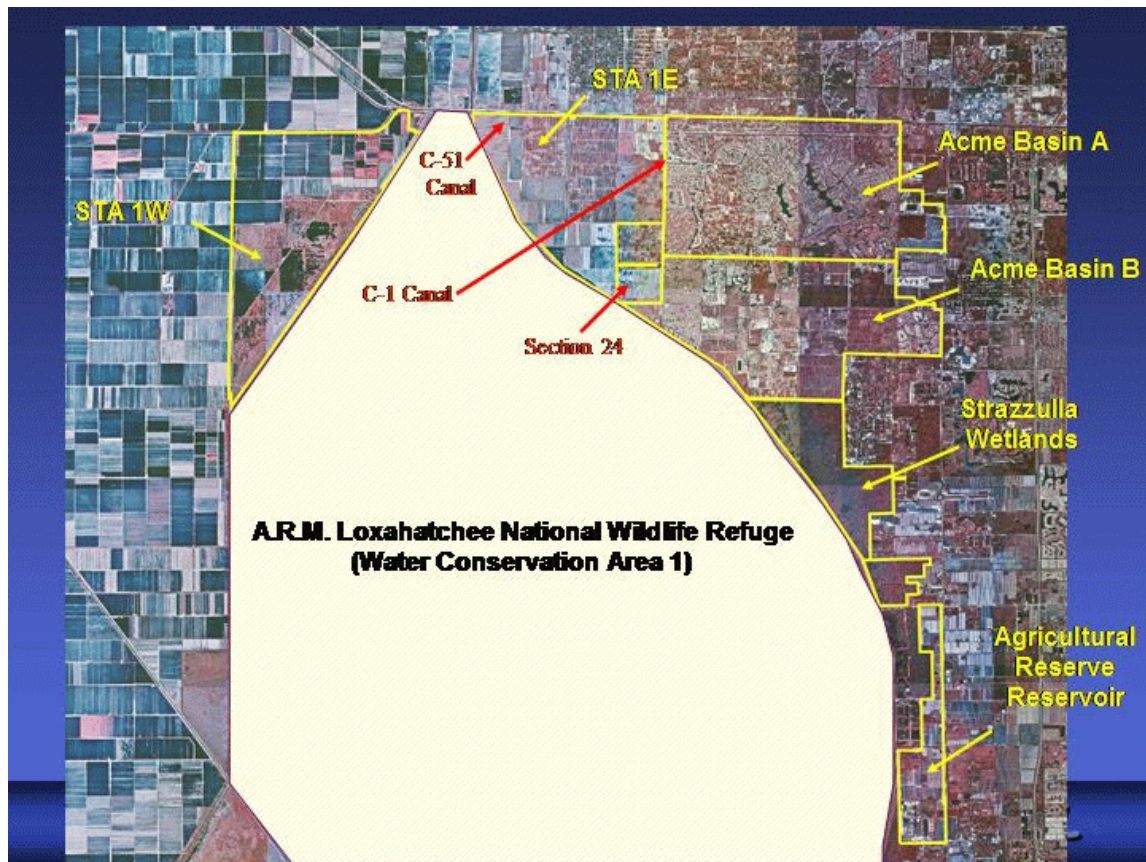


Figure 38-1. Acme Basin B Discharge Project and surrounding area (Figure B-1 [modified], Appendix B; Corps 2002).

Although the PMP for the Acme Project has not been finalized, preliminary discussions concerning the PIR have begun. Preliminary alternatives and scenarios from the Restudy, WPA Feasibility Study, and those developed by District contractors as part of the Basin Specific Feasibility Study are currently being discussed by the PDT. Pending alternative formulation by the PDT, and for the purposes of this report, effects of the Acme Project on federally listed species will be based on the most recent information on scenarios that have the most likelihood of becoming alternatives.

A scenario that does not coincide with the primary purpose of the project was presented in the Basin Specific Feasibility Study and discussed in meetings. This scenario involves the diversion of Acme Basin B water from the Loxahatchee Refuge to an alternate location, such as the PBCARR. As discussed above, the Everglades Forever Act requires nutrient-laden water to meet water quality standards prior to discharge into the Everglades Protection Area. Therefore, water quality standards as per the Everglades Forever Act do not have to be met if the water is not directed into the Everglades Protection Area. However, alternatives directing Acme Basin B

water away from the Loxahatchee Refuge to other areas may result in an overall decrease in the Loxahatchee Refuge water budget and could change hydrological and ecological conditions in the Loxahatchee Refuge and possibly further downstream in the Everglades Protection Area. These alternatives are also undesirable due to the high potential for negative impacts to the Strazzulla Wetlands adjacent to the eastern side of the Loxahatchee Refuge. The Lower East Coast Regional Water Supply Plan incremental modeling predicts that the water budget for the Loxahatchee Refuge will be reduced prior to implementation of the CERP projects that will make water available by 2010. Any additional decrease in the water budget is undesirable. Because this scenario does not address the project purpose and because of the ecological concerns discussed above, only scenarios that continue to provide water to the Loxahatchee Refuge are analyzed in this report.

The use of a chemical treatment facility to treat Acme Basin B water prior to discharge into the Loxahatchee Refuge was also presented in the Basin Specific Feasibility Study and discussed in meetings. As per our June 18, 2002, PAL, the Service would not support any alternative proposing construction of a chemical treatment facility to treat Acme Basin B water prior to discharging directly into the Loxahatchee Refuge. Effects of chemically treated water discharged into the Everglades ecosystem is largely unknown and could result in negative effects to fish and wildlife and their habitat. The District is planning a Marsh Readiness Study to address these effects. Because results of the study will not be available within a time frame needed for the development of alternatives for the Acme Project, scenarios involving chemical treatment of Acme Basin B water are not analyzed in this report. Additionally, scenarios that would have high associated cost will not be analyzed further in this report.

The following are descriptions of features that will be discussed in the scenarios presented below. Section 24 is a parcel of available land along the eastern side of the Loxahatchee Refuge immediately south of Acme Pump Station #2. It consists of approximately 375 acres of agricultural land (sugar cane), and may be used for a constructed wetland or STA. The C-51 canal runs east/west along Southern Boulevard (SR 80), crosses at the northern tip of the Loxahatchee Refuge, and may be used to deliver Acme Basin B water west to STA1-E or east to tide. The C-1 canal runs north approximately 4.5 miles along the eastern side of Section 24 and the western side of Acme Basins A and B and could be used as is or expanded to deliver Acme Basin B water north to the C-51 and/or STA1-E. Approximately 21 acres of disturbed upland is expected to be required for canal expansion. As an alternative to using the C-1 canal to direct water north, the existing canal/culvert system of Acme Basin A, located immediately north of Acme Basin B, could be expanded to direct water north to the C-51 canal or STA1-E. The peak flow permitted by Acme Basin B is approximately 500 cfs. The refuge has technical concerns about the results produced by the study performed by Burns and McDonnell in 2002. The assumptions used in that study resulted in an insensitivity of the model to accurately predict the capability of an optimized STA 1-E with its established footprint to accept Acme Basin B discharges and treat the water within acceptable water quality Standards. To provide reasonable assurance that the existing footprint of STA 1-E would be able to accept and treat Acme B

discharges within acceptable water quality standards (and ensure no increase in number or volume of STA by pass events), further modeling is recommended.

Initial effects analysis for the Acme Basin B Discharge

In a letter dated June 13, 2002, the Service provided a list of federally listed species and their critical habitats that could potentially be affected by the Acme Project to the Corps. Federally listed species that could potentially be affected by the Acme Basin B Discharge Project include the West Indian manatee, the Florida panther, the Everglade snail kite and its critical habitat, the wood stork, the bald eagle, and the eastern indigo snake. Based on available information, there are no confirmed nest sites, rookeries, or den sites for listed species in Section 24 or any sites where pump stations and other structures are likely to be located.

The West Indian manatee is not able to access the project site due to downstream barriers. Florida panthers were historically observed near the Loxahatchee Refuge and were assumed to forage in the vicinity. There have been no confirmed sightings since telemetry data have been recorded (1981) although panthers could potentially range along levees near the Loxahatchee Refuge. No panther foraging or breeding activities are expected in the area. The Loxahatchee Refuge is part of Everglade snail kite critical habitat and snail kites have been known to forage and nest in the Loxahatchee Refuge. Wood storks nest in most years in the Loxahatchee Refuge. Three wood stork rookeries present within the 18.6-mile CFA are as follows: (1) in the Loxahatchee Refuge southwest of Acme Basin B; (2) in WCA 2B to the south; and (3) in eastern WCA 3A North (Rescue Strand) to the southwest. No bald eagle nests have been reported within the potential footprint of the Acme Project. For the eastern indigo snake, the Service suggests techniques be used to reduce effects to potential snake burrows and habitat during activities associated with excavation and construction at Section 24 and canals (expansion along the sides), roads, pump stations, and other associated structures.

Information regarding listed species in the Acme Project area and the Loxahatchee Refuge were gathered from various references including the MSRP, Loxahatchee Refuge Comprehensive Conservation Plan (Service 2000a), the FWC's bald eagle database and Service staff.

Below are five scenarios that may go forward as alternatives with a description of potential effects on federally listed species that may be present in the project area. All scenarios result in Acme Basin B water quality improvement to acceptable standards and subsequent direction of Acme Basin B water into the Loxahatchee Refuge. Alternatives could result from some combination of the following scenarios. As a result of the alternative formulation process to be conducted at a later date, alternatives may be considered that are not included in this report.

SCENARIO 1: Redirection of Acme Basin B water north through the C-1 canal to STA1-E

This scenario would redirect Acme Basin B discharges north through the C-1 canal to the C-51 Canal and/or STA1-E for treatment. This would require 21 acres of upland for expansion of the

C-1 canal. Construction of 2 small pump stations (500 cfs each) would be required to pump water north from Acme Basin B and to direct water into STA1-E. The footprint for each pump station is expected to be approximately 4 acres of disturbed upland, for a total of 8 acres.

Everglade snail kite

Harm: None expected

Benefits: Improved water quality of Acme Basin B water delivered to the Loxahatchee Refuge may improve snail kite foraging and nesting habitat within the Loxahatchee Refuge (146,000 acres).

Wood stork

Potential Harm: None expected

Benefits: Improved water quality of Acme Basin B water delivered to the Loxahatchee Refuge may improve wood stork habitat within the Loxahatchee Refuge (146,000 acres).

Bald eagle

Harm: None expected.

Eastern indigo snake

Potential breeding and foraging habitat exists for the eastern indigo snake along sides of canals and on upland sites used for construction of two pump stations.

Harm: (1) Loss of habitat along existing sides of expanded canals and at pump station sites (approximately 29 acres); (2) Possible mortality of individuals during expansion of canals over two years; and (3) Possible mortality due to activities associated with construction of two pump stations encompassing eight acres - two years. The Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Florida Panthers

Florida panthers were historically observed near the Refuge and were assumed to forage in the vicinity. In more recent years, there have been no confirmed sightings although panthers could potentially range along Refuge levees and adjacent areas.

Potential Harm: This scenario would convert approximately 21 low value panther habitat acres (disturbed land - FLUCCS 740) to expand canals constituting 21 zero value panther acres (streams and waterways – FLUCCS 510). In addition, 8 low value acres (disturbed land – FLUCCS 740) may be lost in order to construct two pump stations. A total of 29 acres of panther habitat may be lost.

SCENARIO 2: Redirection of Acme Basin B water north through Acme Basin A to STA1-E

This scenario would redirect Acme Basin B discharges north through the existing canal system of Acme Basin A. Additional culverts (approximately five) would be required to allow for the increased volume of water through Acme Basin A. The construction and footprint of the culverts would be negligible. Two pump stations would be required, one at the southern end of Acme Basin B to direct water north and one to direct Acme Basin B water into the C-51 Canal and/or STA1-E. The footprint for each pump station is expected to be approximately 4 acres of disturbed upland, for a total of 8 acres.

Everglade snail kite

Harm: None expected

Benefits: Improved water quality of Acme Basin B water delivered to the Loxahatchee Refuge may improve snail kite foraging and nesting habitat within the Loxahatchee Refuge (146,000 acres).

Wood stork

Harm: None expected

Benefits: Improved water quality of Acme Basin B water delivered to the Loxahatchee Refuge may improve wood stork habitat within the Loxahatchee Refuge (146,000 acres).

Bald eagle

Harm: None expected.

Eastern indigo snake

Potential breeding and foraging habitat exists for the eastern indigo snake on upland sites used and construction of two pump stations. Harm: (1) Possible mortality due to activities associated with construction of two pump stations comprising 8 acres total - two years; and (2) Possible mortality of individuals on levee and/or construction roads. The Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Florida Panthers

Potential Harm: In this scenario, approximately 8 low value panther habitat acres (disturbed land – FLUCCS 740) may be lost in order to construct two pump stations.

SCENARIO 3: Combination of redirecting Acme Basin B water north via Scenario 1 and 2 (see above)

Harm: See Scenario 1 and 2

Benefits: See Scenario 1 and 2

Florida Panthers

Potential Harm: This scenario is a combination of Scenario 1 and 2. A total of 29 acres of low value panther habitat may be lost.

SCENARIO 4: Redirection of Acme Basin B water into an STA constructed on Section 24

This scenario would redirect Acme Basin B discharges into an STA to be constructed on Section 24 (approximately 375 acres). The STA will include 24,000 linear feet of levee, 12 feet wide which will provide approximately 17 acres of habitat. This scenario assumes water quality standards will be met by the constructed STA and treated effluent will be discharged directly into the Loxahatchee Refuge via a new pump station which will require approximately four acres of disturbed upland for construction.

Everglade snail kite

Harm: None expected

Benefits: Improved water quality of Acme Basin B water delivered to the Loxahatchee Refuge may improve snail kite foraging and nesting habitat within the Loxahatchee Refuge (146,000 acres).

Wood stork

Harm: (1) High levels of present or mobilized contaminants on Section 24 or in receiving water from Acme Basin B could result in potential harm to individuals feeding in the area. The potential for harmful levels of contaminants in STA waters will depend upon analysis of contaminant and Hazardous, Toxic, and Radioactive Waste results on Section 24 and Acme Basin B waters. Of particular concern would be possible high levels and/or mobilization of contaminants in reservoir waters upon first flooding, as the STA dries down, and upon reflooding. Contaminants of concern include mercury and other metals, ammonia, petroleum hydrocarbons, polynuclear aromatic hydrocarbons, polychlorinated biphenyls, organophosphates, organochlorines, and persistent herbicides; (2) Current agricultural practices on Section 24 lands (approximately 375 acres) may provide temporary wood stork foraging habitat that will be lost to the STA.

Benefits: Improved water quality of Acme Basin B water delivered to the Loxahatchee Refuge may improve wood stork habitat within the Loxahatchee Refuge (146,000 acres).

Bald eagle

Harm: None expected.

Eastern indigo snake

Potential breeding and foraging habitat currently exists for the eastern indigo snake on approximately 375 acres of agricultural land in Section 24.

Harm: (1) Loss of 375 acres of potential breeding and foraging habitat due to flooding of Section 24; (2) Loss of approximately 4 acres of habitat due to construction of one pump station; (3) Possible mortality due to STA excavation and construction activities - two years; and (4) Possible mortality of individuals on levee and/or construction roads. The Service recommends the initial flooding of the STA be slow enough to allow terrestrial wildlife to vacate the area. The Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Benefit: The STA will provide approximately 17 acres of potential breeding and foraging habitat along levees.

Florida Panthers

Potential Harm: Approximately 375 low value panther habitat acres (sugar cane – FLUCCS 2156) may be lost in order to construct an STA on Section 24.

Potential Benefit: This scenario would convert approximately 375 low value panther habitat acres (see above) to approximately 358 high value acres (emergent aquatic vegetation – FLUCCS 644) for panthers. In addition, constructed levees would result in approximately 17 medium value acres (herbaceous – FLUCCS 310 - STAs) for panthers.

SCENARIO 5: Redirection of Acme Basin B water into a constructed wetland or STA on Section 24 (whose effluent does not meet water quality standards) with subsequent effluent delivery to STA1-E

This scenario would redirect Acme Basin B discharges into an STA constructed on Section 24 (approximately 375 acres) whose effluent does not meet water quality standards or to a constructed wetland on Section 24 to serve as an initial filter marsh and/or holding area. Both possibilities would require the resulting effluent be directed north to the C-51 Canal and/or STA1-E via Scenario 1, 2, or 3.

Harm: See Scenario 4 and Scenario 1, 2, or 3

Benefit: See Scenario 4 and Scenario 1, 2, or 3

Florida Panthers

Potential Harm: See Scenario 4 and 1, 2, or 3.

Potential Benefit: If an STA is constructed, the potential benefits would be the same as in Scenario 4. If a wetland with associated upland is constructed, approximately 263 high value panther habitat acres (wetland/emergent aquatic vegetation – FLUCCS 644) would be generated. In addition, approximately 112 high value upland acres (oak-pine-hickory – FLUCCS 423) would be generated.

Coordination with Corps and the District for the Acme Basin B Discharge Project

The project biologist submitted a draft of this document to the Corps and The District project managers for comment. The project managers concurred with the project description and scenarios described.

Section 7 consultation documents

June 13, 2002. Letter providing a list of threatened and endangered species and critical habitat associated with the Acme Project.

Strazzulla Wetlands Project description

The Strazzulla Wetlands Project (Strazzulla Project) is associated with the Strazzulla Wetlands adjacent to the eastern boundary of the Loxahatchee Refuge, also known as WCA 1 (Fig. 39-1). The project was originally listed in the Restudy as an Other Project Element entitled the “Protection and Enhancement of Existing Wetland Systems along the Loxahatchee NWR, including the Strazzulla Tract” (Corps 1999). This component would: (1) involve the acquisition of 3,335 acres to expand the spatial extent of protected natural areas; (2) make a hydrological and ecological connection to the Loxahatchee Refuge; (3) act as a buffer between higher water stages to the west and agricultural lands to the east that must be drained; (4) provide vital habitat connectivity for species that require large unfragmented tracts of land for survival; and (5) protect the only remaining cypress habitat in the eastern Everglades and one of the few remaining sawgrass marshes adjacent to the coastal ridge.

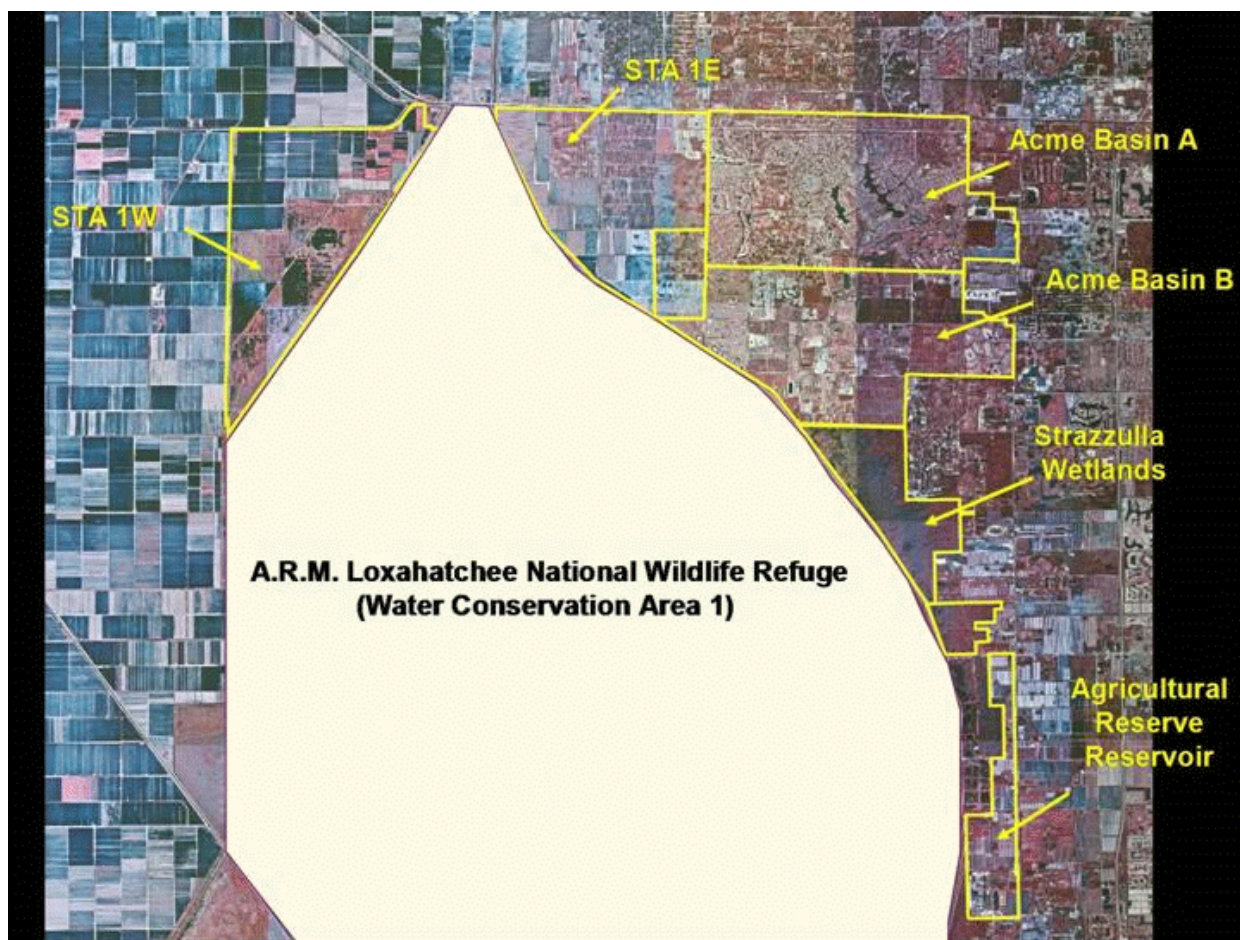


Figure 39-1. Map of Strazzulla Wetlands Project footprint and surrounding area (Figure B-1, Appendix B; Corps 2002).

The Other Project Element became a component of the feasibility study for the WPAs and was entitled "Strazzulla Wetlands." With the authorization of the Water Resources Development Act of 2000, new requirements for CERP plan formulation were established for all PIRs. These requirements included additional information over that used in feasibility studies. Although the WPA Feasibility Study was near completion, the report required additional information to meet the new requirements of a PIR. It was decided that separate CERP PIRs would be completed to address individual WPA components and work already accomplished would be brought forward to the new PIRs. A separate PMP and PIR/Environmental Impact Statement for the Strazzulla Project will be developed to assess the WPA design and/or alternative designs that can provide similar benefits to the natural system as shown in the CERP. Project cost cannot exceed \$25 million in order for the Strazzulla Project to remain under Corps program authority.

The PMP process for the Strazzulla Project has begun but is not yet complete. The PIR process will follow the completion of the PMP. The basic design of the Strazzulla Project alternative is anticipated to be similar to the design in the Recommended Plan of the Draft WPA Feasibility Study. For the purposes of this report, the design features of the WPA Feasibility Study Recommended Plan for Strazzulla Wetlands will be discussed (Fig. 39-2).

The WPA Strazzulla Wetlands design featured construction of a 2 to 3-foot high berm along the eastern boundary, a conveyance canal, and two gated culvert structures. The total length of the constructed eastern boundary berm (L-510 Berm) would be approximately 41,910 feet long (8 miles) and require a clearing limit of approximately 50 feet in width, a total of approximately 48 surface acres. The berm would increase retention of surface water volume and enhance hydroperiods in the Strazzulla Wetlands, prevent loss of surface flows/seepage to the adjacent urbanized areas and drainage canal system, and provide a barrier to prevent reverse flow of urban storm runoff.

A conveyance canal, the Lake Worth Drainage District (LWDD) S-9 Extension Canal, would be constructed to extend the LWDD S-9 Canal to LWDD L-23W Canal. The extension canal would be approximately 5,965 feet (1 mile) in length with a clearing limit of 100 feet in width, a total of approximately 13.7 surface acres. The new conveyance canal would restore and improve drainage compared to the existing flowage easement by redirecting the current overflow of storm runoff into the wetlands from an isolated developed area. Two single barreled and gated culvert structures would be constructed. One, the S-530, would have a design flow of 300 cfs and be located at the eastern boundary of the Strazzulla Wetlands in the LWDD L-23W Canal that transverses the wetland area. The S-530 would function to manage water stages in the L-23W Canal by dividing and isolating the LWDD canal system from Strazzulla Wetlands when water supply deliveries are not needed by LWDD and preventing loss of water volume to LWDD drainage system when LWDD water supply demands have been met. The second culvert located at the southern end of the new conveyance canal (LWDD S-9 Extension Canal) would have a design flow of 625 cfs. The construction and footprint of the culverts will be negligible.

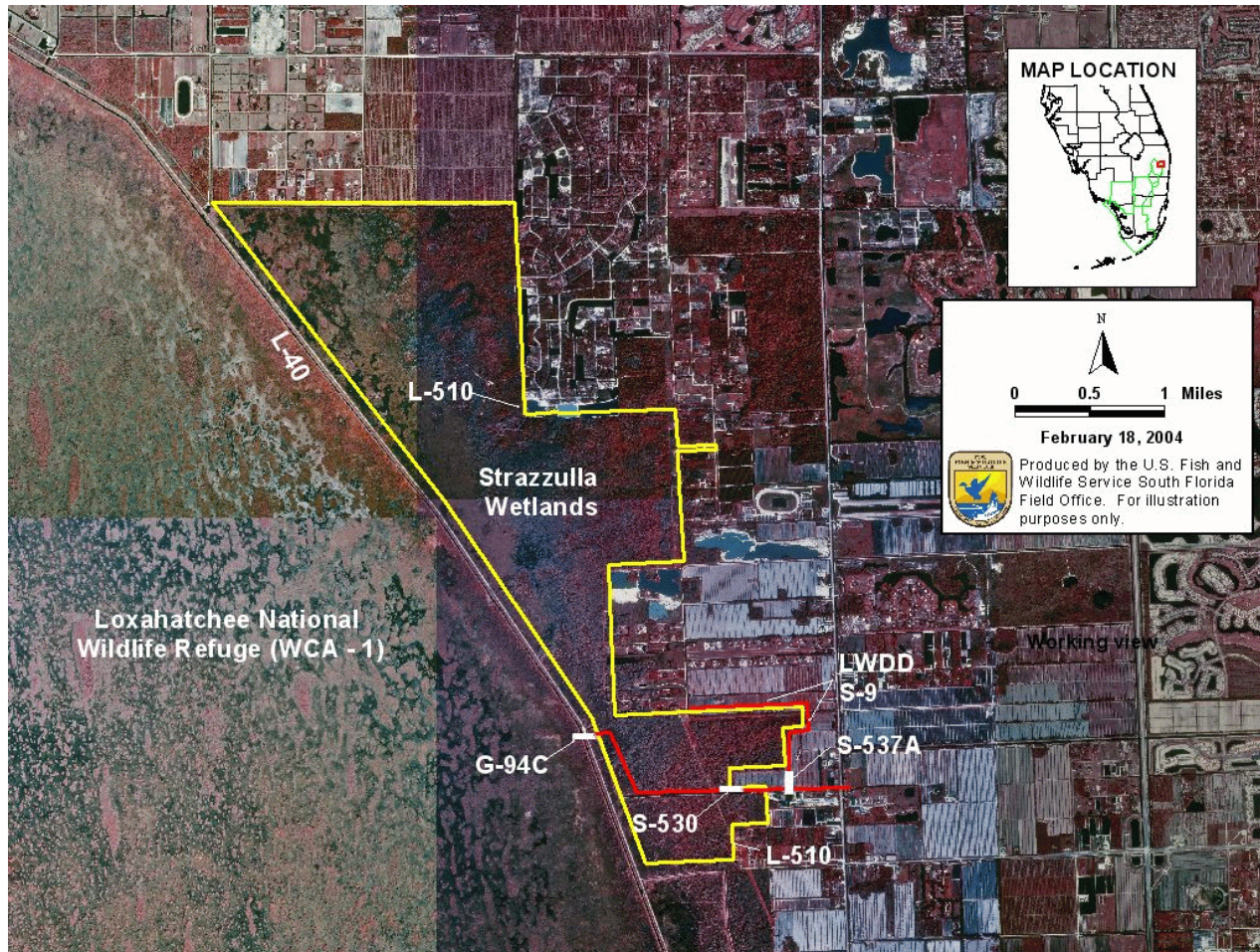


Figure 39-2. Map of Strazzulla Wetlands Project design adapted from the *Draft Water Preserve Areas Feasibility Study Recommended Plan* (2001).

A habitat evaluation using the Wetland Rapid Assessment Procedure was performed during the WPA Feasibility Study and presented in a February 2001 Supplemental Planning Aid Report prepared by the Service. Six types of habitat were identified for the 3,356 acres of the Strazzulla Project: (1) 325 acres of hydric pine flatwoods; (2) 111 acres of wet prairie and cypress with 50 percent melaleuca, Australian pine and *Lygodium*, exotic invasive species; (3) 1,310 acres of cypress forest; (4) 1,092 acres of sawgrass marsh with less than 10 percent cypress; (5) 418 acres of mixed cypress hardwoods; and (6) 100 acres of disturbed marsh/shrub encroachment. The Restudy originally cited 3,335 acres for the project, a difference of 1 acre. Wildlife sign and utilization were observed in all habitat types.

Initial effects analysis for the Strazzulla Wetlands Project

At this time, six federally listed species are identified that could potentially be affected by the Strazzulla Project. These include the Florida panther, the Everglade snail kite and its critical habitat, the wood stork, the bald eagle, and the eastern indigo snake. The Draft FWCA Report prepared by the Service for the Draft WPA Feasibility Study included the Cape Sable seaside sparrow as a species that could be effected by the WPAs. Since Cape Sable seaside sparrow populations are located further south in Florida, the Strazzulla Project will not effect this species. Based on available information, there are no confirmed nest sites, rookeries, or den sites for listed species on the potential Strazzulla Project footprint. Information regarding listed species in the Strazzulla Project area and the Loxahatchee Refuge were gathered from various references including the MSRP, Loxahatchee Refuge Comprehensive Conservation Plan (Service 2000a), the FWC's bald eagle database and Service staff.

Below are descriptions of potential effects on federally listed species that may be present in the Strazzulla Project area based on the Recommended Plan design for the Draft WPA Feasibility Study. The length of time for completed construction is unknown. During the Strazzulla Project alternative formulation process to be conducted at a later date, an alternative may be considered that is different from the one presented in this report.

Florida panther

Florida panthers were historically observed near the Loxahatchee NWR and were assumed to forage in the vicinity. In more recent years, there have been no confirmed sightings although panthers could potentially range along levees near the Refuge. The project is located within the panther "Core, Other" area. There are approximately 3,125 acres of high quality, 5 acres of medium quality, and 15 acres of low quality habitat within the project area. The Strazzulla project will improve habitat quality on 20 acres and throughout the entire project area through removal of exotic vegetation. In addition, the project will protect existing natural areas adjacent to the Loxahatchee NWR by reducing runoff into the project area thus ensuring a rain driven hydrologic regime. The project will also improve habitat quality by improving water quality.

Everglade snail kite

The Loxahatchee Refuge is part of the Everglade snail kite critical habitat and snail kites historically nested and have been known to forage and rest in the Loxahatchee Refuge. Snail kites may rest in trees or utilize portions of the existing Strazzulla Wetlands marsh for foraging.

Harm: It is not expected that resting trees or forage habitat will be lost along the eastern perimeter of the Strazzulla project as this corridor is heavily infested with exotic vegetation. The eastern perimeter of the project generally has the least habitat value for snail kites. The eastern perimeter of the project generally has the least habitat value within the Strazzulla Project footprint.

Benefits: Improved/protected hydrology and water quality in marsh and forested areas may increase foraging, resting, and possible future nesting opportunities within the Strazzulla Project footprint. Acquisition of the 3,336 acres of Strazzulla Wetlands will preserve potential habitat and protect the area from future development.

Wood stork

During appropriate hydrological conditions, the Strazzulla Wetlands may afford foraging and resting habitat for wood storks. Wood storks nest in most years in the Loxahatchee Refuge. Three wood stork rookeries present within the 18.6-mile CFA are as follows: (1) in the central and southern portions of the Loxahatchee Refuge; (2) in WCA 2B to the south; and (3) in eastern WCA 3A North (Rescue Strand) to the southwest.

Harm: Possible loss of resting tree areas or marsh foraging areas due to construction activities along the eastern perimeter of the Strazzulla Project - construction of approximately 1 mile of canal, 100 feet wide (13.7 acres) and 8 miles of a constructed berm, 50 feet wide (48 acres) for a total of 61.7 acres. The eastern perimeter of the project generally has the least habitat value within the project footprint.

During the planning process the Service's *Habitat Management Guidelines for the Wood Stork in the Southeastern Region*, *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Stork In The South Florida Ecological Services Consultation Area* and *Wood Stork Standard Operating Procedures for Endangered Species* should be consulted.

Benefits: Improved/protected hydrology and water quality in marsh and forested areas may increase foraging, resting, and possible future nesting opportunities within the Strazzulla Project footprint. Acquisition of the 3,336 acres of Strazzulla Wetlands will preserve potential habitat and protect the area from future development.

Bald eagle

No bald eagle nests have been reported within the potential footprint of the Strazzulla Project or the Loxahatchee NWR.

Harm: None expected.

Eastern indigo snake

Potential breeding and foraging habitat exists for the eastern indigo snake in upland and short-hydroperiod wetland areas within the Strazzulla Project footprint. The eastern indigo snake may also live and breed in the Loxahatchee Refuge. The Service suggests techniques be used to reduce effects to potential eastern indigo snake burrows and habitat during activities associated with excavation and construction of berms, canal, roads, levees, and other associated structures. The Service's *Standard Measures for the Eastern Indigo Snake* should be implemented during project construction.

Harm: (1) possible loss of habitat suitable for breeding and foraging due to construction activities along the eastern perimeter of the Strazzulla Project - construction of approximately 1 mile of canal, 100 feet wide (13.7 acres) and 8 miles of a constructed berm, 50 feet wide (48 acres) for a total of 61.7 acres; (2) possible mortality due to excavation and construction activities along the eastern perimeter of the Strazzulla Project - construction of approximately 1 mile of canal, 100 feet wide (13.7 acres) and 8 miles of a constructed berm, 50 feet wide (48 acres) for a total of 61.7 acres; and (3) possible mortality of individuals on levee and construction roads.

Benefit: There may be an increased habitat functional value due to construction of approximately 8 miles of berm, 50 feet wide (approximately 48 acres) which may increase available upland. The Service recommends minimizing disturbances along sides of canals (such as excavation or low cutting maintenance activities). Acquisition of the 3,336 acres of Strazzulla Wetlands will preserve potential habitat and protect the area from future development.

Coordination with Corps and the District for the Strazzulla Wetlands Project

As discussed in the project description, the Strazzulla Project was previously a component of the feasibility study for the WPAs (Corps 2001). During the WPA planning process, interagency coordination with the Service consisted of attending PDT meetings and participating in development of the PMP and the WPA Feasibility Study. The Strazzulla Project subsequently became a separate project under CERP. As the planning process has not yet begun for the Strazzulla Project, there have been no meetings or documents requiring interagency coordination.

Section 7 consultation documents

On September 23, 2000, the Corps initiated informal section 7 consultation by letter for the original WPA project configuration, which included Strazzulla. The consultation was based on all WPA project components in Palm Beach, Broward, and Miami-Dade Counties, encompassing a significantly larger project description and included effects analysis for threatened and endangered species for all components.

On October 24, 2000, the Service provided a letter to the Corps including a list of species which could be affected by the project. In that correspondence, the Service recommended that the Corps continue informal consultation throughout the preliminary planning process as design iterations were evaluated.

On March 21, 2001, the Corps forwarded a Biological Assessment by letter. The Biological Assessment considered potential effects on the following species: West Indian manatee, snail kite, wood stork, Cape Sable seaside sparrow, and eastern indigo snake. The Corps determined that the WPA project is not likely to adversely affect any of the considered species or adversely modify critical habitat.

On April 18, 2001, the Service concurred by letter with the Corps determination. This concurrence covered the physical layout of the selected plan and considered the range of operations as modeled in the PSP and PSPS 1234 regional water model simulations. The Service recommended reinitiation of consultation on the snail kite, wood stork, and Cape Sable seaside sparrow once a more detailed operational plan is proposed for the WPA project.

40 Site 1 Impoundment

The PDT for this project has not yet begun to formulate and evaluate alternatives; therefore, all potential harm to threatened and endangered species is based on the preferred alternative outlined in the WPA Feasibility Study. As the project planning moves forward, and other alternatives are considered, a different preferred alternative may be chosen which may result in different effects to threatened and endangered species.

Site 1 Impoundment project description

The Site 1 Impoundment is a separable CERP element (Corps 1999) located in southern Palm Beach county adjacent to the Hillsboro Canal (Fig. 40-1). The purpose of the project is to capture and store water currently lost to tide through the Hillsboro Canal. This stored water will be used to meet water supply demands, reducing demands on Lake Okeechobee and the Loxahatchee Refuge. Details of construction methods are not yet available as the project is still in the draft PMP development stage.

According to the WPA Feasibility Study, the project includes an 8-foot deep impoundment providing an effective storage area of 1,680 acres with a total project footprint of 1,800 acres (Fig. 40-2). A 1,500-cfs inflow pump station (S-525A) will be located on the southern boundary of the impoundment and is designed to capture storm runoff in addition to backpumping seepage from adjacent canals currently conveyed to the Hillsboro Canal. The impoundment will consist of two internal compartments separated by a levee (L-508I) with a two-barrel gated culvert (S-528A) to pass water between cells. A seepage canal (C-508N) will be constructed along the eastern boundary with a fixed ungated weir (S-527A) to maintain optimal water levels within the seepage canal. An emergency overflow spillway is designed for the southern boundary of the western cell near the pump station and will discharge into the Hillsboro Canal. To accommodate this additional water supply, conveyance of the Hillsboro Canal will be increased from the impoundment inflow structure east to the LWDD E-1 canal (approximately 6.75 miles) by widening the canal bottom from 16 to 40 feet. This canal improvement will be conducted within the existing canal banks with no anticipated widening of the existing canal footprint. The S-39A structure will be replaced with a new, larger two-barrel gated culvert S-527B structure.

Initial effects analysis for the Site 1 Impoundment Project

Estimated habitat losses are based on existing conditions data from the WPA Feasibility Study. Changes to existing habitat may have occurred since Wetland Rapid Assessment Procedure analysis for the project area was completed. There is a difference of 95 acres between the habitat data provided in the report versus the total project footprint. It is not clear where the additional acres come from. Species are assumed to be present in appropriate habitat as described in the MSRP. Surveys of the area have not been conducted at this time.

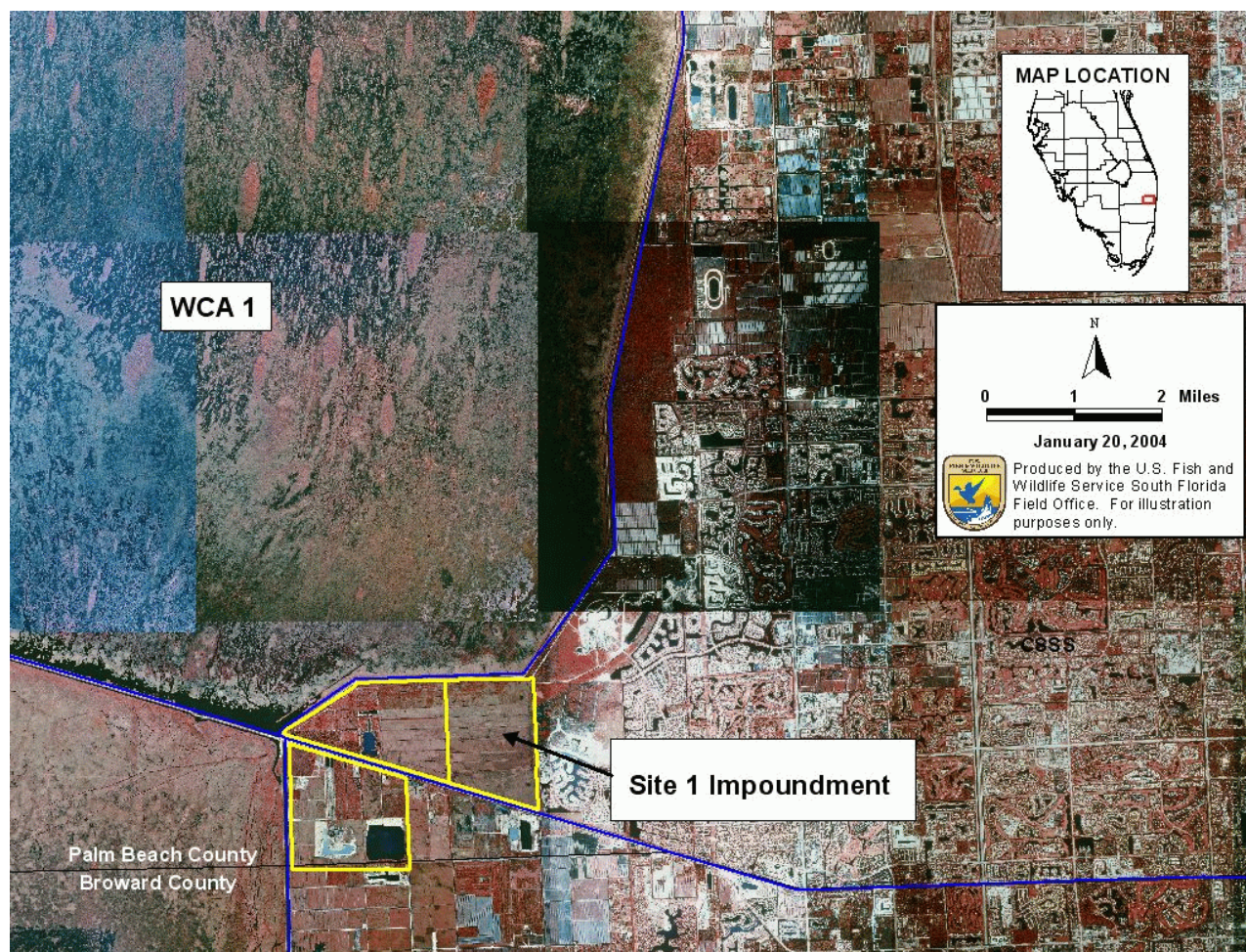


Figure 40-1. Location of Site 1 Impoundment (not to scale).

Wood stork colony locations were obtained from the Loxahatchee Refuge database. Bald eagle nest locations were obtained from the FWC database.

Wood stork

Harm: 265 acres of remnant sawgrass wetland, 753 acres of improved pasture and 348 acres of wet pasture will be lost to the impoundment for a total of 1,366 acres. The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks in the South Florida Ecological Services Consultation Area* should be consulted during project planning.

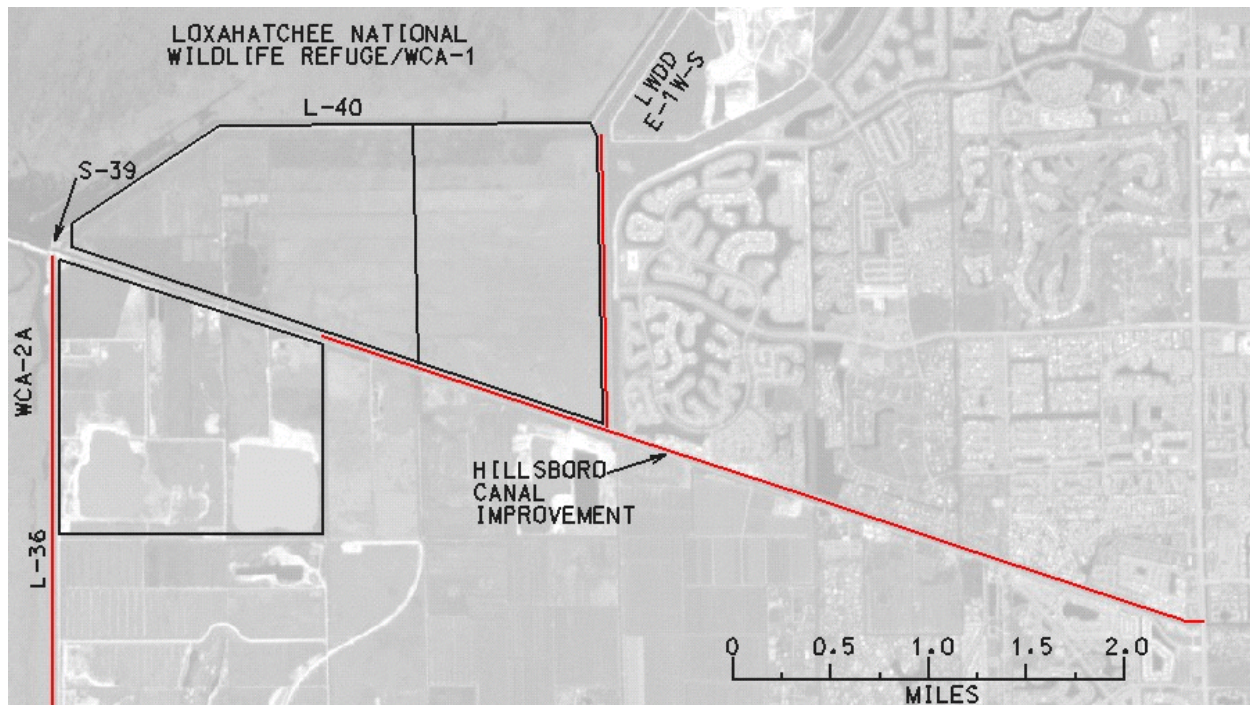


Figure 40-2. Detailed map of Site 1 Impoundment from the *Draft Water Preserve Areas Feasibility Study Recommended Plan* (2001).

Benefit: Construction of a 1.5 miles of 30 foot wide littoral shelf within the eastern boundary seepage canal will provide 5.3 acres of foraging habitat.

Bald eagle

Harm: New electrical lines will be required for pump station S-525A. These lines will be near open water including the Site 1 Impoundment and the Hillsboro Canal. The publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

Benefit: The impoundment may provide 1,680 acres of foraging habitat for bald eagles as perch sites will be available along the levee and the Hillsboro Canal.

Eastern indigo snake

Harm: 130 acres of upland shrub/tree habitat, 209 acres of abandoned tree nursery habitat, 753 acres of improved pasture, 265 acres of remnant sawgrass wetland and 348 acres of wet pasture will be lost to the impoundment for a total of 1,705 acres. Indigo snakes may be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Benefit: 30,080 feet of 12 foot wide levee will be constructed, providing 8.28 acres of potential habitat for indigo snakes.

Coordination with the Corps and the District for the Site 1 Impoundment Project

March 5, 2003. Telephone conversation with Jeff Couch to discuss project features.

March 13, 2003. Email from Jeff Couch agreeing with description.

Section 7 consultation

On September 23, 2000, the Corps initiated informal section 7 consultation by letter for the original WPA project configuration, which included Bird Drive Recharge Area. The consultation was based on all WPA project components in Palm Beach, Broward, and Miami-Dade Counties, encompassing a significantly larger project description and included effects analysis for threatened and endangered species for all components.

On October 24, 2000, the Service provided a letter to the Corps including a list of species which could be affected by the project. In that correspondence, the Service recommended that the Corps continue informal consultation throughout the preliminary planning process as design iterations were evaluated.

On March 21, 2001, the Corps forwarded a Biological Assessment by letter. The Biological Assessment considered potential effects on the following species: West Indian manatee, snail kite, wood stork, Cape Sable seaside sparrow, and eastern indigo snake. The Corps determined that the WPA project is not likely to adversely affect any of the considered species or adversely modify critical habitat.

On April 18, 2001, the Service concurred by letter with the Corps determination. This concurrence covered the physical layout of the selected plan and considered the range of operations as modeled in the PSP and PSPS 1234 regional water model simulations. The Service recommended reinitiation of consultation on the snail kite, wood stork, and Cape Sable seaside sparrow once a more detailed operational plan is proposed for the WPA project.

43 Bird Drive Recharge Area

Bird Drive Recharge Area Project description

As described in the Restudy and the WPA Feasibility Study, this project includes pumps, water control structures, canals, and an aboveground recharge area with a total storage capacity of approximately 5,975 acre-feet located in western Miami-Dade County (Fig. 43-1). For the Selected Plan, the design of the recharge area was reduced to 1,493 acres with water levels fluctuating up to 4 feet above grade to protect the Miami-Dade West Wellfield. Located immediately east of the recharge area is a 2,243-acre wetland enhancement area. This wetland area has average stages between 1 and 1.5 feet and is operated to maintain a muhly grass prairie. The recharge area and the wetland enhancement area encompass a project footprint of approximately 3,815 acres.

The purpose of this component design is to capture runoff from the western C-4 basin and accept inflows from the future West Miami-Dade Wastewater Treatment Plant. This project will recharge groundwater and reduce seepage from ENP buffer areas by increasing water table elevations east of Krome Avenue (Fig. 43-2). The facility will also provide C-4 basin flood peak attenuation and water supply deliveries to the South Dade Conveyance System and Northeast Shark River Slough via seepage.

Inflows from the western C-4 basin and from the proposed West Miami-Dade Wastewater Treatment Plant will be pumped into the western portion of the proposed recharge area (Fig. 43-3). C-4 basin runoff in excess of 200 cfs will be discharged eastward. Inflows from the West Miami-Dade Wastewater Treatment Plant will be continuous when the recharge area depth is equal to or less than 3 feet above ground. West Miami-Dade Wastewater Treatment Plant discharges will be diverted to a deep well injection disposal system if the water depth is greater than 3 feet or if the C-4 inflow pump is in operation. A seepage management system will be operated around the east and southern perimeters of the recharge area. Seepage will be returned to the 4-foot deep recharge area. Recharge area outflows will be prioritized to meet: (1) groundwater recharge demands; (2) South Dade Conveyance System demands; and (3) Northeast Shark River Slough demands, when supply is available. Regional system deliveries are routed through the recharge area via an 800-cfs capacity canal that runs along the north and west side of the Bird Drive Recharge Area to the South Dade Conveyance System to alleviate flooding impacts to urban areas to the east. Engineering design for the Bird Drive Recharge Area has not been formulated at this time.

Access to the Bird Drive Recharge Area has not been designed at this time. Existing county and state roads (including Tamiami Trail and Krome Avenue) provide access to the region.

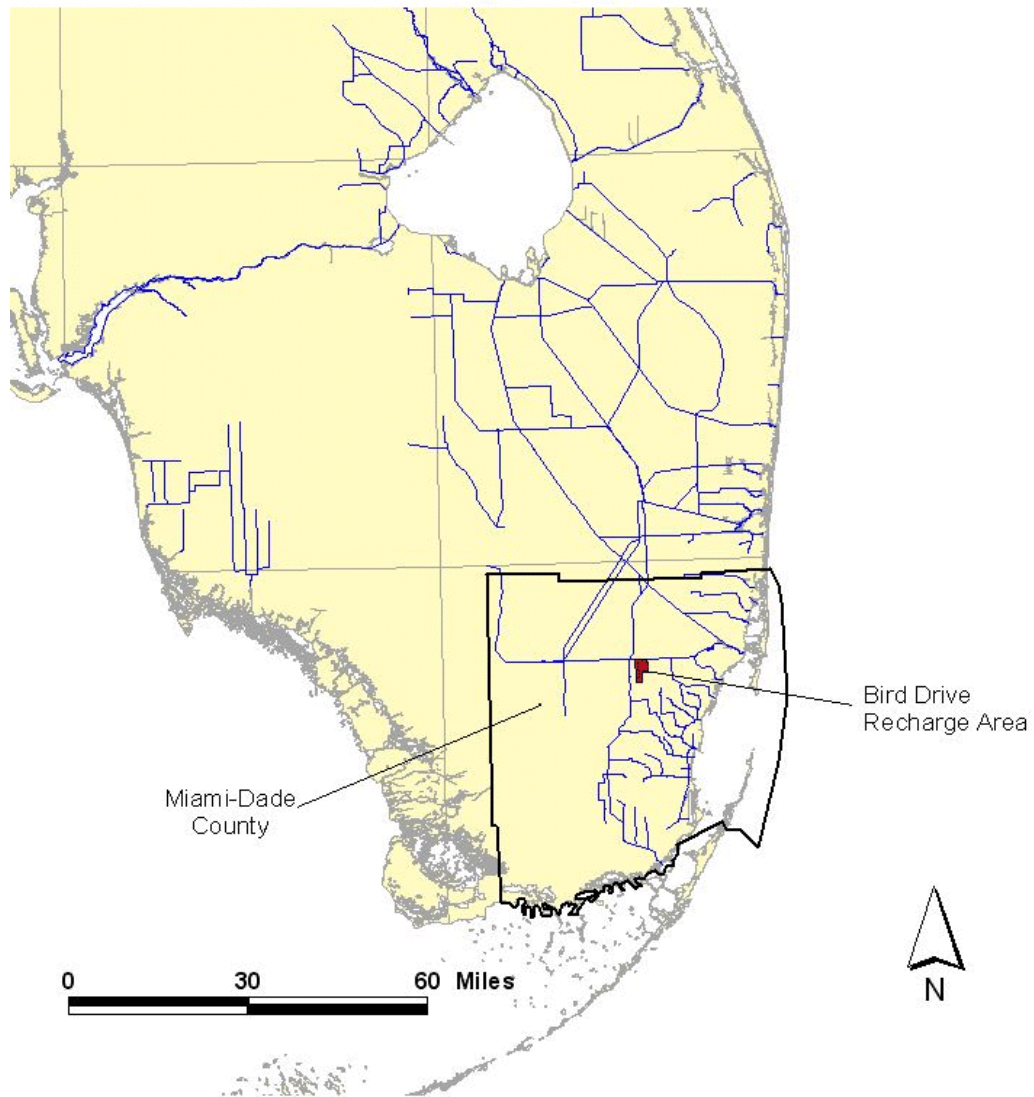


Figure 43-1. Location of Bird Drive Recharge Area Project within Miami-Dade County.

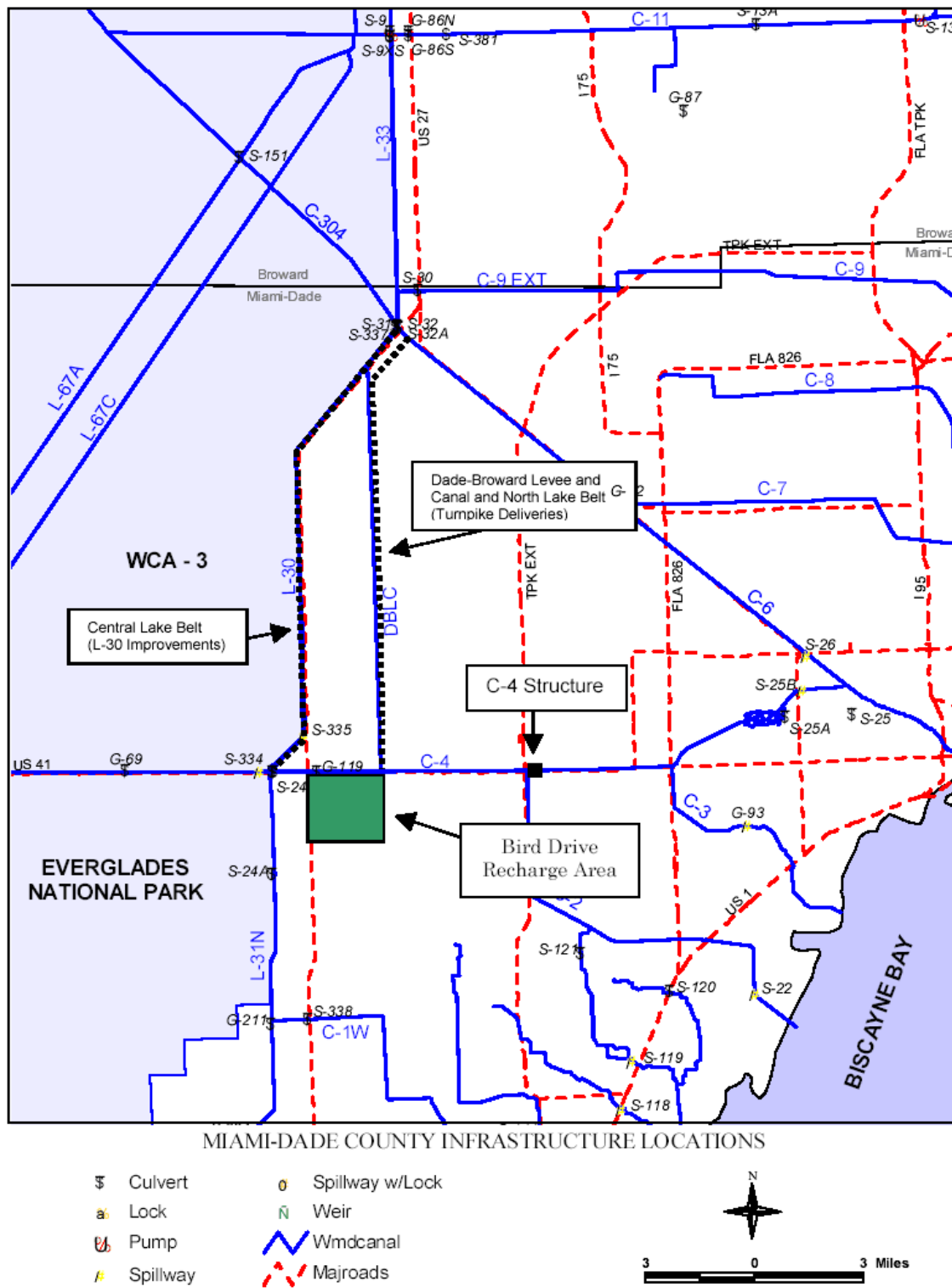


Figure 43-2. Miami-Dade County infrastructure locations (Figure 6.3-4, Corps 2001).

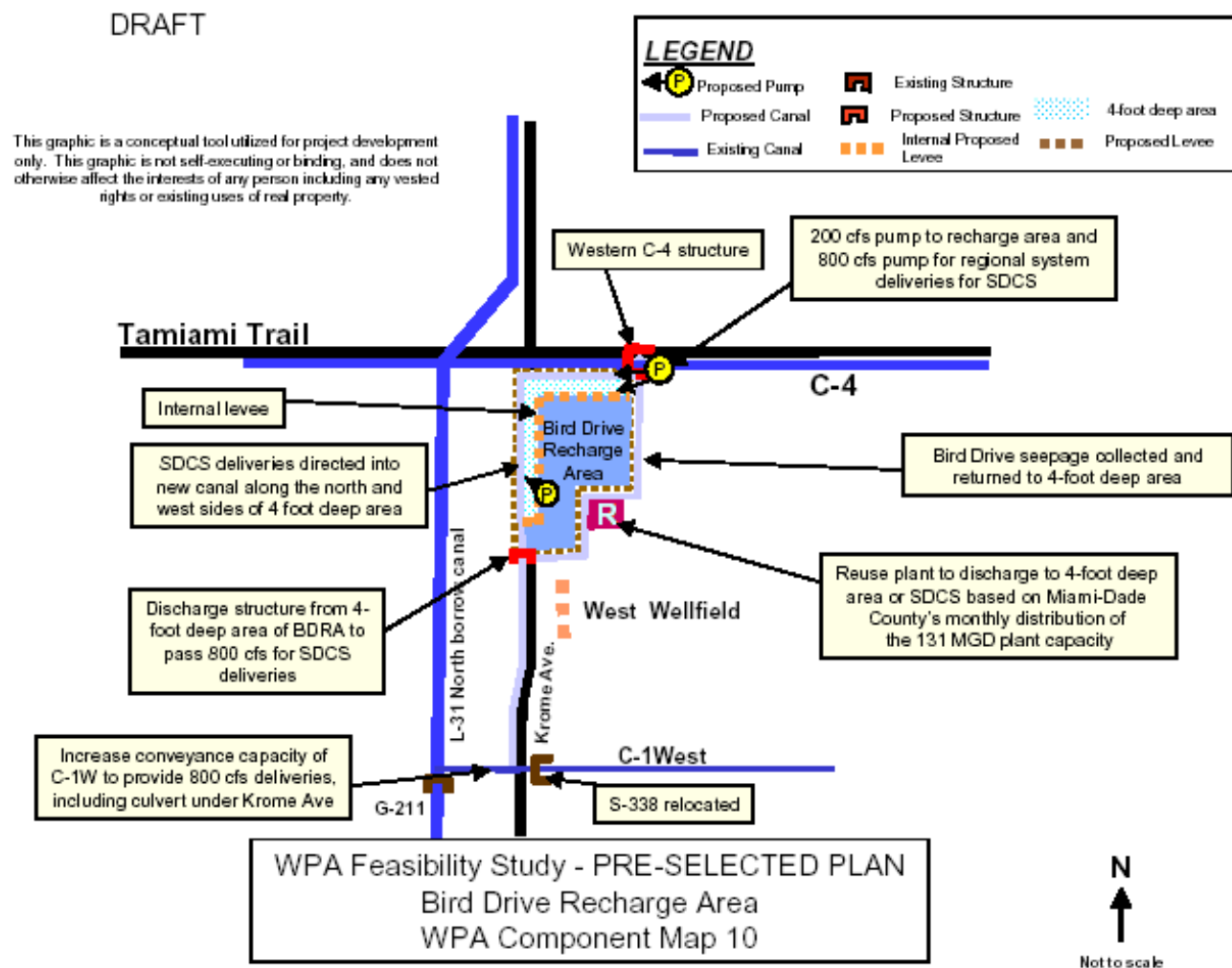


Figure 43-3. Alternative D13R: Bird Drive Basin and L-31N Seepage Management (Component Map 10, Pre-Selected Plan, Corps 1999).

Initial effects analysis for the Bird Drive Recharge Area Project

Existing Conditions

As described in the Draft FWCA Report in the WPA Feasibility Study, Bird Drive Recharge Area was divided into a northern and southern area. The northern area encompasses approximately 2,809 acres of mixed wetland communities. For the purposes of a Wetland Rapid Assessment Procedure analysis, the northern area was divided into 6 polygons which consists of: 1,091 acres of muhly/sawgrass prairie with beakrush and mermaid weed; 464 acres of sawgrass with 10 to 50 percent melaleuca with some muhly and beakrush; 301 acres of sawgrass with 50 to 75 percent melaleuca with a scattering of wax myrtle and ground cover composed of sawgrass, stink weed, cord grass, maidencane, beakrush, and water dropwort; 854 acres of sawgrass with greater than 75 percent melaleuca and ground cover composed of sparse sawgrass, coinwort, water hyssop, stink weed, and bracken fern; 75 acres of sawgrass with dense melaleuca saplings and ground cover composed of sparse sawgrass, swamp fern, and buttonbush; and 24 acres of tree islands/willow heads that are composed of willow, pond apple, and dahoon holly and ground cover composed of water hyssop, coinwort, leather fern, swamp fern, buttonbush, and swamp fern. The southern Bird Drive Area encompasses approximately 1,006 acres of mixed wetland communities. For the purposes of the Wetland Rapid Assessment Procedure analysis, this area was divided into 5 polygons which consists of: 365 acres of muhly/sawgrass prairie with beakrush, and mermaid weed; 116 acres of muhly/sawgrass prairie with 25 to 75 percent melaleuca; 453 acres of dense melaleuca with a sparse ground cover of sawgrass, coinwort, water hyssop, stink weed, and bracken fern; five acres of tree islands/willow heads composed of willow, pond apple, Brazilian pepper and dahoon holly and ground cover composed of water hyssop, coinwort, leather fern, swamp fern, buttonbush, and swamp fern; and 67 acres of old-field habitat comprised of cane grass, bushy broom grass, duck potato, and primrose willow.

Hydrologic modeling data indicate that project implementation would likely result in an overall improvement of 2,336 functional units (a measure that incorporates the size of the habitat unit with the habitat's ecological function, calculated by multiplying the wetland area in acres by an index of functional capacity) under the Selected Plan by precluding development within project lands and improving hydrology and hydropattern to a majority of lands within the scope of the project. In addition to hydrologic improvements, long-term management of non-native species will be implemented by the District and Miami-Dade County. Improvements to the quality, quantity, timing and distribution of water to these areas will protect and sustain wetland habitats resulting in functional recovery. This will benefit the extended system by increasing the spatial extent of productive short hydroperiod muhly grass prairie.

FLUCCS codes (1995) were used to estimate habitat potentially used by threatened and endangered species at present, as well as habitat areas potentially lost or gained upon completion of the project (Table 43-1). The project should be analyzed again, using updated FLUCCS codes, to more accurately classify land areas.

Table 43-1. Habitat potentially used by threatened and endangered species within the Bird Drive Recharge Area. Florida Land Use Cover Classification (FLUCCS) codes were used to classify land areas.

FLUCCS Classification	FLUCCS Level 3	Acres
<i>Wetland Enhancement Area</i>		
Row Crops	214	94
Brazilian Pepper	422	9
Melaleuca	424	670
Streams and Waterways	510	5
Reservoirs < 10 acres	534	10
Mixed Shrubs	617	7
Freshwater Marshes	641	1607
Water Supply Plant	833	3
<i>Recharge Area</i>		
Fixed Single Family Units	111	3
Melaleuca	424	855
Streams and Waterways	510	34
Reservoirs < 10 acres	534	7
Freshwater Marshes	641	529
Roads and Highways	814	56
Communication Facility	822	4

Wood stork

The Bird Drive Recharge Area is within the CFA of three wood stork colonies (Fig. 43-4).

Harm: The conversion of 1,384 to 1,579 acres (estimates using FLUCCS and Wetland Rapid Assessment Procedure data, respectively) of short-hydroperiod wetlands to long-hydroperiod (up to 4 feet deep) wetlands would constitute harm. However, if timing and duration of water level fluctuations correspond to wood stork foraging and nesting requirements, portions of the recharge area may benefit the species. The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning.

Benefit: 697 acres of the wetland enhancement project area (currently classified as urban, agricultural, or dominated by non-native species, according to FLUCCS) may potentially serve as habitat upon completion of the project (Table 43-1). This area estimate assumes that the

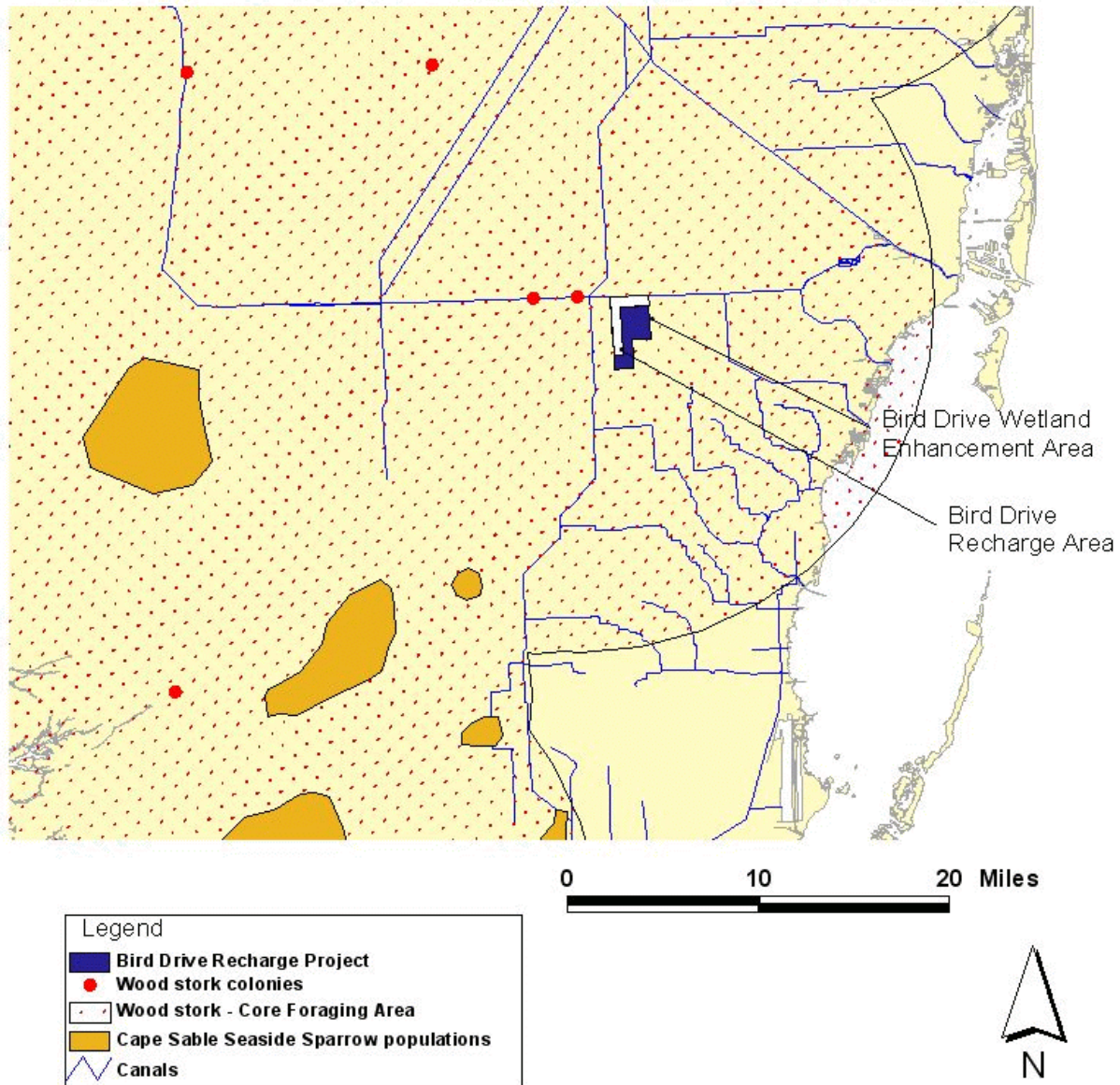


Figure 43-4. Threatened and endangered species associated with the Bird Drive Recharge Area.

operation of the wetland enhancement area “to maintain a muhly grass prairie” indicates that 670 acres of melaleuca will be removed. This area can be considered a habitat gain only if plant material is completely removed, disposed of away from the site and a monitoring/ maintenance plan is established. The perimeter of the recharge area (approximately 10 miles) could provide nine acres of suitable wood stork habitat if littoral shelves designed to concentrate fish were added to the project plans.

Eastern indigo snake

The indigo snake is a likely inhabitant of the Bird Drive Project area, due to potentially suitable habitat.

Harm: The conversion of 1,447 acres of freshwater marsh, stream and waterways, melaleuca, and other upland cover types to long-hydroperiod wetlands (up to 4 feet deep) may constitute a reduction in eastern indigo snake habitat. Approximately 1 acre of edge habitat (important foraging habitat for indigo snakes) will be lost (5,233 feet [reservoirs], 10,725 feet [streams and waterways]). Indigo snakes may be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* will be implemented during project construction and included in the environmental protection plan when the Corps proceeds to the plans and specifications phase for the project.

Benefit: Eastern indigo snake road mortality may be reduced as 56 acres of roads and highways will be removed in this project. Proposed levees for this project approximate 16 miles in length. Eastern indigo snakes may benefit from the approximately 23 acres of potential habitat created by these levees.

West Indian manatee

Manatees are known to reach and be killed or injured at inland water control structures, and the Service and Corps are part of a multi-agency effort to eliminate this threat. Manatees are known to use the C-4, L31N and Bird Drive canals and protective measures should be implemented at the pump station delivering water into the project. Further guidance for structure design and manatee conservation for CERP is being developed by a multi-agency team. Construction activities within canals used by manatees may disturb or injure manatees. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented in areas accessible to manatees.

Coordination with the Corps and the District for the Bird Drive Recharge Area Project

September 5, 2002. WPA PDT meeting announcing separation of project into 9 distinct projects/PIRs.

October 2, 2002. Site visit with the District.

November 9, 2002. Project overview meeting with the District.

February 24 and 28, 2003. Sent e-mail to the Corps requesting project description verification.

February 24 and 28, 2003. Sent e-mail to the District requesting projects description verification.

Section 7 consultation history for Bird Drive Recharge Area

On September 23, 2000, the Corps initiated informal section 7 consultation by letter for the original WPA project configuration, which included Bird Drive Recharge Area. The consultation was based on all WPA project components in Palm Beach, Broward, and Miami-Dade Counties, encompassing a significantly larger project description and included effects analysis for threatened and endangered species for all components.

On October 24, 2000, the Service provided a letter to the Corps including a list of species which could be affected by the project. In that correspondence, the Service recommended that the Corps continue informal consultation throughout the preliminary planning process as design iterations were evaluated.

On March 21, 2001, the Corps forwarded a Biological Assessment by letter. The Biological Assessment considered potential effects on the following species: West Indian manatee, snail kite, wood stork, Cape Sable seaside sparrow, and eastern indigo snake. The Corps determined that the WPA project is not likely to adversely affect any of the considered species or adversely modify critical habitat.

On April 18, 2001, the Service concurred by letter with the Corps determination. This concurrence covered the physical layout of the selected plan and considered the range of operations as modeled in the PSP and PSPS 1234 regional water model simulations. The Service recommended reinitiation of consultation on the snail kite, wood stork, and Cape Sable seaside sparrow once a more detailed operational plan is proposed for the WPA project.

ASR Regional Study Project description

The ASR Regional Study will address system-wide issues beyond the scope of the individual ASR Pilot Projects. It will investigate regional, technical issues governing the feasibility of full-scale ASR implementation. In addition, it will identify the impacts of CERP ASR, and the potential effect(s) on water levels and water quality within the Floridan Aquifer System, as well as those potential impacts to existing water users, surface-water, and the flora and fauna that inhabit them.

The objectives of the ASR Regional Study are as follows:

- a. To integrate and synthesize ASR data collection efforts.
- b. To develop a regional groundwater model and sub-regional models necessary to evaluate ASR performance and effects.
- c. To address issues pertaining to the magnitude and scope of the CERP ASR program implementation; and
- d. To formulate and recommend a technically feasible or optimal regional ASR alternative with consideration and evaluation of well cluster alternatives, geographical alternatives within the CERP study area, alternative facility configurations and implementation phasing and sequencing.

Specifically, the ASR Regional Study will investigate the feasibility of full-scale implementation of the 333-well ASR configuration proposed in the CERP. A PDT has developed the ASR Regional Study scope of work. With the assistance of vested stakeholders and the interested public, the study goals and objectives have been established.

Initial effects analysis for the ASR Regional Study Project

The Regional ASR Project is strictly a study with no construction involved. As study results allow discernment of the numbers and locations of individual “spin-off” ASR projects, each project will be subject to section 7 consultation. Since the footprints of individual ASR wells will be small (usually around 5 acres), it is primarily indirect impacts (*i.e.*, water quality of discharged recovered waters) which will have the greatest implications for biological impacts and future Section 7 analysis. Although geological factors will probably be the driving force in locating and determining the actual numbers of ASR wells eventually built, there are certain biological and ecological siting and operational criteria which would reduce any potential take to listed species. These include:

- a. Siting well and any associated treatment footprints in areas of low biological value such as disturbed upland sites.

- b. Minimizing the impact of temporary construction and permanent access roads by employing best management practices.
- c. Locating intake and discharge structures in artificial canals or reservoirs with limited fisheries communities.
- d. Treating released recovered waters to mesh with localized water quality parameters (*e.g.*, temperature, dissolved oxygen, hardness, heavy metals) in downstream receiving bodies.
- e. Employing intake designs and screening mechanisms to reduce entrainment and impingement of adult, juvenile and larval fish.

Coordination with the Corps and the District for the ASR Regional Study Project

Coordination has occurred via the PDT.

Section 7 consultation

Section 7 consultation has not been initiated.

Broward County Water Preserve Area Project description

The Broward County WPA is a separable element of the CERP that includes the C-11 Impoundment, the C-9 Impoundment, and the WCA 3A/3B Levee Seepage Management area. The conceptual design incorporates a series of interconnected buffer marsh areas, canals, levees, water control structures, and aboveground impoundments. The project area encompasses approximately 8,953 acres east of WCA 3 and west of existing developed areas (Fig. 45-1). The northern and southern boundaries are marked by the North New River Canal and the C-6 canal, respectively (Fig. 45-2). The primary goal of the Broward County WPA is to provide a hydrologic buffer between the Everglades and developed lands, and to assist in meeting the future water needs of all users (agriculture and urban) and the environment by supplying additional regional storage (Corps 2001). Specific objectives of the project include: (1) reducing demands on the Everglades and Lake Okeechobee for water supply; (2) reducing seepage losses from the Everglades by holding more water in the natural system; (3) improving natural hydropatterns within existing natural areas; (4) capturing, storing, and treating stormwater currently lost to tide; and (5) eliminating discharge of polluted water into the Everglades Protection Area.

C-11 STA/Impoundment

This component is located in the C-11 canal basin in western Broward County (Fig. 45-3) and includes buffer marsh areas, canals, levees, water control structures, and a 4-foot deep aboveground impoundment with a total storage capacity of approximately 5,960 acre-feet. Water control structures include two pump stations, one gated spillway, one gated culvert, one non-gated culvert, two fixed weir structures, one emergency overflow spillway, and perimeter seepage control canals. The impoundment is divided into 2 compartments totaling 1,695 acres. Water levels will fluctuate up to 4 feet above grade in the 1,490-acre compartment. The remaining 205 acres in the northern compartment will be a marsh buffer area, which can provide emergency storage of up to 2 feet. The 2-foot maximum depth for this compartment is proposed to accommodate the relocation and consolidation of 91 acres of permitted mitigation currently located within the 1,490-acre compartment footprint.

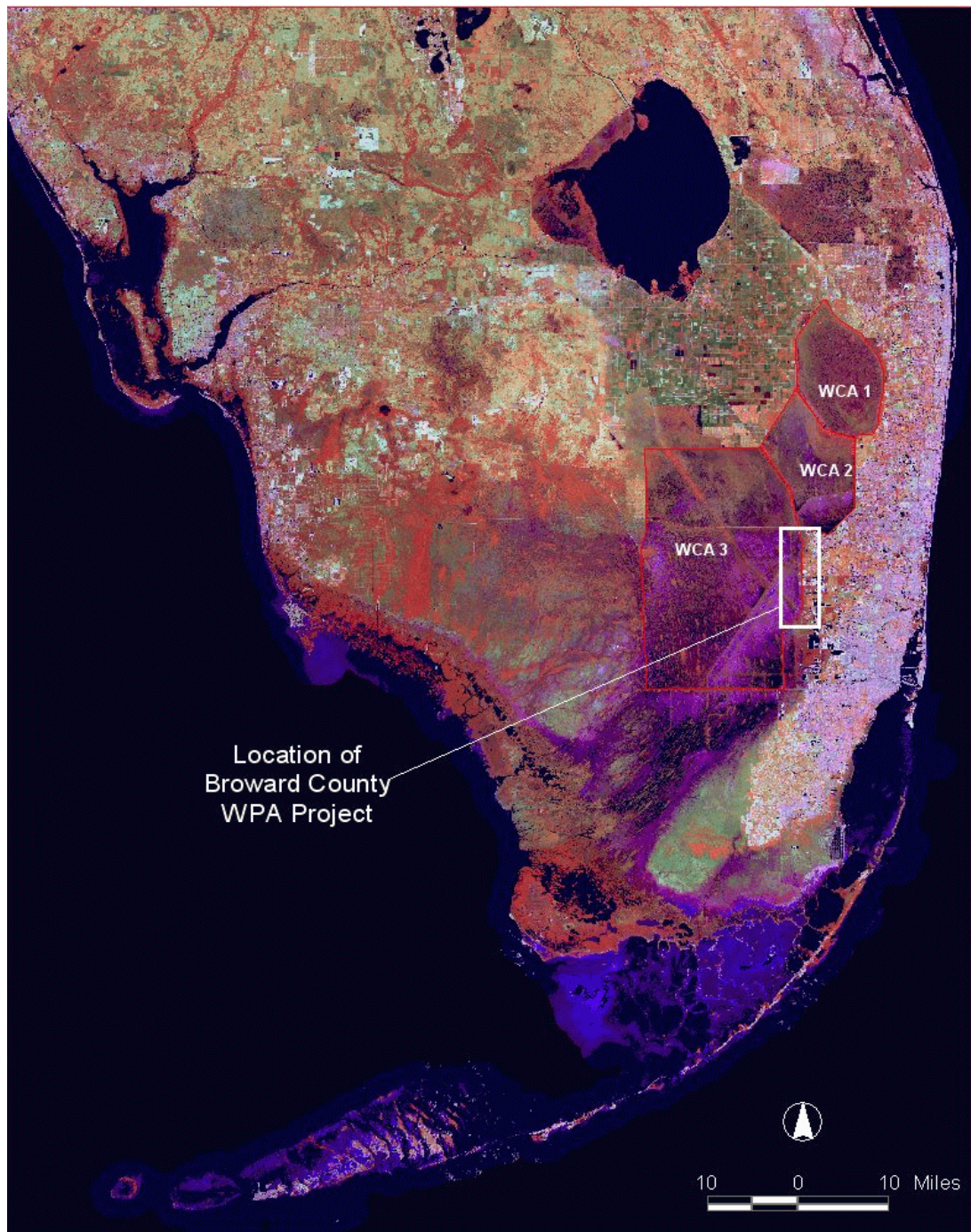


Figure 45-1. Location of the Broward County Water Preserve Areas. The project is located east of WCA 3 and west of existing developed areas.

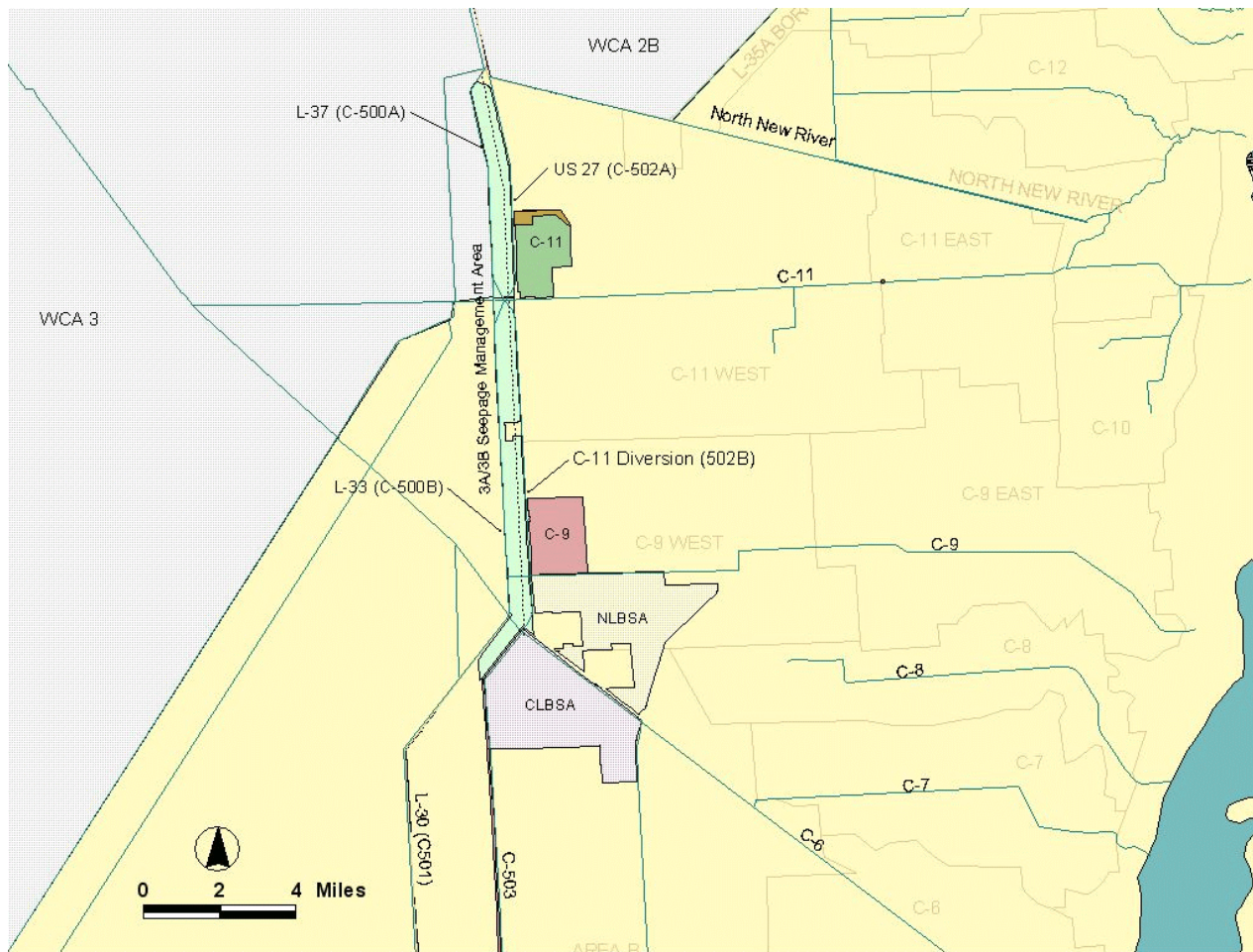


Figure 45-2. Components and features of the Broward County Water Preserve Areas. The project includes the C-11 and C-9 Impoundments and the 3A/3B Seepage Management Area.

The purpose of C-11 STA/Impoundment is to capture untreated runoff currently back pumped from the western C-11 basin into WCA 3A and to reduce seepage from adjacent natural areas (WCA 3A and WCA 3A Seepage Management Area). Captured water is first diverted to the C-11 Impoundment, then to the C-9 Impoundment, then to the North Lake Belt Storage Area (when built). The design makes use of flow control structures and a 2,500-cfs diversion canal (C-502 A/B) that replaces the US-27 borrow canal to transfer water from the C-11 Impoundment to the C-9 Impoundment. When storage capacity is not available in the impoundments or North Lake Belt Storage Area, runoff will be pumped into WCA 3A via the S-9 pump station to provide flood protection for the western C-11 basin. There may be times where direct discharge into WCA 3A can be avoided by temporarily storing up to 4 feet of water in the wetland marsh buffer



Figure 45-3. Components and features of the Broward County Water Preserve Areas C-11 Impoundment. The impoundment is divided into two compartments, a 1,490-acre reservoir and a 205-acre marsh buffer area.

area. It is important to note, however, that water stored at this depth for more than 8 to 12 hours can harm the wetland vegetation. Thus, this option should not be used if there is a possibility of adversely impacting the permitted mitigation within the buffer area. During the dry season, the impoundment also will function to meet water supply demands for Pond Apple Slough (located east of S-13A), recharge Broward County well fields, improve groundwater elevations in the eastern C-11 basin, and prevent saltwater intrusion.

The C&SF Restudy modeling results demonstrated that the combined operation of the C-11 Impoundment and C-9 Impoundment can significantly reduce pumping into WCA 3A, although not all flooding events can be stored in the impoundments as they are designed. The existing flood control system will remain operational to handle major storm events that are beyond the capability of the system to control. The designed system allows operational flexibility to transfer

water to the C-9 Impoundment if storage is available, transfer water to adjacent wetland buffer areas in the C-11 and C-9 Impoundments, direct flows further to the south, and/or use the current option to send water eastward to tide if conveyance is available. All of these alternatives should be used prior to pumping into WCA 3A. The project will not operate at maximum efficiency until the North Lake Belt Storage Area is available for storage. Modeling indicates that the North Lake Belt Storage Area will reduce backpumping of stormwater into WCA 3 by 90 percent. Without the North Lake Belt Storage Area, backpumping of stormwater can only be reduced by 60 percent (Jeff Needle, District, personal communication 2003). The design of this component of the Broward County WPA is shown in Figure 45-3.

C-9 Impoundment

This feature includes canals and a 4-foot deep aboveground impoundment with a total storage capacity of approximately 1,650 acre-feet located in the western C-9 canal basin in Broward County. The purpose of the C-9 Impoundment features is to: (1) pump excess storm runoff from the western C-9 basin into the impoundment and reduce loss of excess runoff to tide; and (2) impound western C-11 basin diverted runoff to prevent discharge of untreated runoff into WCA 3A. The impoundment includes 25 ASR injection wells (5 mgd capacity, each) with chlorination for pre-treatment and aeration for post treatment. Seepage water is collected by deep horizontal supply wells and toe drains that are constructed along the impoundment's levees. The location, extent of treatment and number of ASR wells may be modified based on findings from a proposed ASR pilot project. Results from pilot studies will be incorporated into the design and operation of all ASR projects.

During the wet season and periods of high rainfall, excess runoff will be diverted from the western C-11 and C-9 basins into the North Lake Belt Storage Area or the C-9 Impoundment and ASR storage system wherever storage is available. Water from these storage areas is returned to the C-9, C-6/C-7, C-2/C-4 Canals and to Biscayne Bay to help maintain canal stages in the dry season. The impoundment will provide groundwater recharge, assist in reducing seepage from adjacent natural areas (WCA 3B and WCA 3B Seepage Management Area), and assist in meeting water supply demands and prevention of saltwater intrusion. Water supply demands met by the impoundment will reduce releases from the regional system in support of the Everglades restoration effort. The Impoundment may provide opportunities to increase flood damage reduction capabilities through operational changes of the CERP and local drainage systems. Additionally, the Impoundment may provide limited water quality improvements. The C-9 Impoundment design is shown in Figure 45-4.



Figure 45-4. Components and features of the Broward County Water Preserve Areas C-9 Impoundment. This component includes canals and a 4-foot aboveground impoundment with a total storage capacity of approximately 1,650 acre-feet located in the western C-9 canal basin in Broward County.

WCA 3A/3B Levee Seepage Management

This feature includes levees and water control structures located adjacent to WCAs 2 and 3 in Broward and Miami-Dade Counties. The purpose of this project element is to reduce seepage from WCA 3A and 3B and improve hydropatterns within the WCAs. This will be accomplished by allowing higher water levels in the borrow canals and maintaining longer duration inundation within the marsh areas that are located between the eastern boundary of the WCAs and US Highway 27. The design will allow excess water collected within the wetland area to be conveyed to Northeast Shark River Slough or other specified targets if Northeast Shark River Slough water demands are met. If needed, backpumping to WCA 3A by pump station S-9A can be accomplished with a minor design enhancement.

The L-37 (C-500A) and L-33 borrow (C-500B) canals will be held at higher stages as part of the seepage management system. The canals also will be used to convey flows as part of the WCA 2B Flow Diversion System. Seepage from the WCAs and marshes will be collected and directed south into the Central Lake Belt Storage Area. This will maintain flood protection and the separation of seepage water from urban runoff originating in the western C-11 basin and regional water supply deliveries. The design also includes conveyance canals C-502A and C-502B as part of CERP's North New River rerouting of Miami River deliveries for South Dade Conveyance System. The C-502A and C-502B canals will provide conveyance of Lake Okeechobee deliveries and western C-11 basin diverted waters south to meet water supply demands and diversion targets (C-9 Impoundment and North Lake Belt Storage Area), respectively.

The WCA 3A Seepage Management Area and C-500A canal will be managed at seasonal water surface elevations of 7.50 feet NGVD during the wet season, and 6.50 feet NGVD during the dry season. The WCA 3B Seepage Management Area and C-500B canal will be managed at seasonal water surface elevations of 6.50 feet NGVD during the wet season and 5.50 feet NGVD during the dry season. The WCA 3A/3B Levee Seepage Management design is shown in Figures 45-5.

Existing Conditions for Broward County Water Preserve Area

The following section describes the existing vegetation for each of the WPA components as described in the Draft FWCA Report contained within the WPA Feasibility Study.

C-11 Impoundment

The C-11 Impoundment encompasses approximately 1,814 acres of mixed wetland communities (Table 45-1), with the majority of the area consisting of unimproved pasture comprised of sawgrass with heavy infestation of melaleuca seedlings. At the time of the assessment, one area of unimproved pasture had been severely impacted by over drainage and was being invaded by shrubby species. Approximately 10 percent of the project area was documented as improved pasture with numerous wetland species such as pickerel weed, duck potato, and arrowhead. Even during the dry season, several of these species were present. Another 5 percent of the area was part of an abandoned tree nursery, which consisted of 50 to 70 percent undesirable non-wetland grassy species. There also were 2 active tree nurseries with a ground cover of 70 to 75 percent Bahia grass. The remaining area consisted of freshwater marsh.

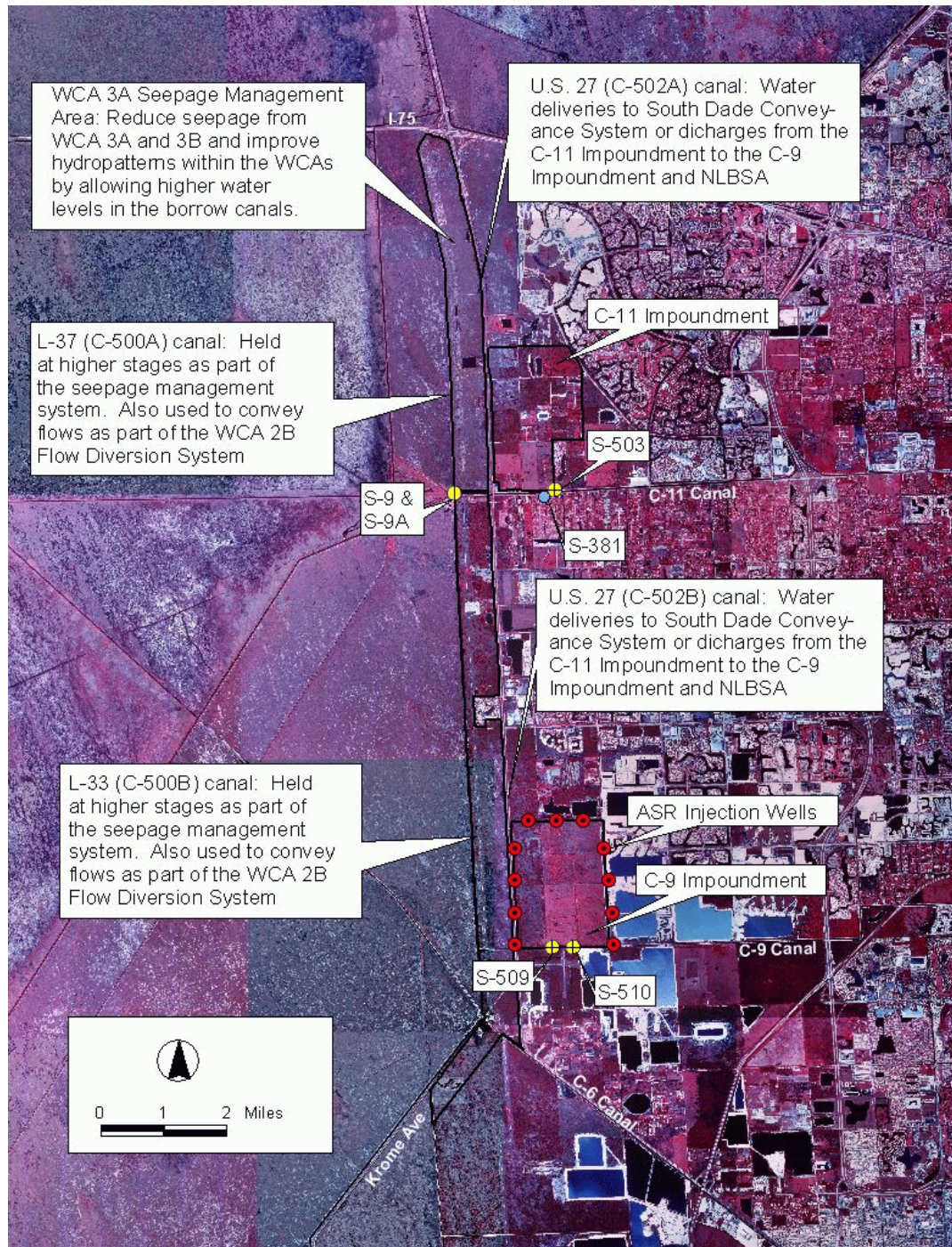


Figure 45-5. Components and features of the Broward County Water Preserve Areas Water Conservation Area 3A/3B Seepage Management Area. The project element will reduce seepage from Water Conservation Area 3A and 3B and improve hydropatterns within the Water Conservation Areas.

C-9 Impoundment

The C-9 Impoundment encompasses approximately 1,850 acres of mixed wetland communities (Table 45-1). At the time of the assessment, a large portion of the area was composed of melaleuca and wax myrtle with less than 10 percent sawgrass. Much of the remaining area was a freshwater marsh/prairie complex. This vegetative assembly was composed of maidencane, spikerush, primrose willow, saltbush, dog fennel, duck potato, torpedo grass, and broomsedge.

Table 45-1. Land use practices and acres of potential habitat within the Broward County Water Preserve Areas. Land use practices were determined using FLUCCS GIS data sets (FDOT 1995). Caution should be used when interpreting these data as land use likely has changed since 1995 as a result of urban development, invasion by exotic plant species, and natural ecological processes.

Land Use	Broward WPAs Total Acres	Available Acres per WPA Project Component		
		C-11 Impoundment	C-9 Impoundment	Seepage Management
Melaleuca	1,896.8	87.4	274.3	1,535.1
Improved Pastures	1,479.1	224.5	1,254.6	-
Freshwater Marshes	1,182.9	-	223.9	942.3
Unimproved Pasture	947	938.3	8.8	-
Freshwater Marshes - Sawgrass	923.9	-	-	923.9
Electrical Power Transmission Lines	900.9	-	-	900.9
Tree Nurseries	482.1	482.1	-	-
Mixed Wetland Hardwoods - Shrubs	476.8	8.3	-	467.8
Streams and Waterways	133.8	-	9.1	120.3
Roads and Highways	108.5	-	-	81.4
Rural Lands in Transition	75.1	-	-	75.1
Fixed Single Family Units	60.6	14.8	28.7	17.1
Xeric Oak	44.9	-	44.9	-
Reservoirs Less Than 10 Acres	31	6.7	-	24.4
Undeveloped Land Within Urban	26.1	-	-	26.1
Brazilian Pepper	25.1	-	-	25.1
Mixed Hardwoods	24.3	12.6	-	11.7
Parks and Zoos	24	-	-	24
Borrow Areas	24	15.4	-	8.6
Electrical Power Facilities	23.5	-	-	23.5
Mobile Home Units Any Density	20.6	-	-	19.7
Reservoirs larger than 10-100 acres	19.6	-	-	19.6
Spoil Areas	10.8	10.8	-	-
Other Groves	5.7	-	5.7	-
Mixed Wetland Hardwoods	3.3	3.3	-	-
Mixed Wetland Hardwoods-Willows	2.4	2.4	-	-
TOTAL ACRES	8,952.8	1,806.4	1,849.9	5,296.5

WCA 3A/3B Seepage Management Area

The WCA 3A Seepage Management Area encompasses approximately 1,961 acres of mixed wetland communities (Table 45-1). Sawgrass marsh, with 30 percent melaleuca, Brazilian pepper, ficus, and seedling pond apple comprised part of the site. Maidencane, spikerush, primrose willow, and beak rush also were present with the sawgrass. Another part of the site was comprised of sawgrass marsh with less than 10 percent melaleuca. Water dropwort, maidencane, primrose willow, beak rush, and mermaid weed also were observed in this association. Another marsh community comprised of sawgrass, cattail, maidencane, primrose willow, beak rush, mermaid weed, arrowhead, and pickerel weed was documented, as was a smaller disturbed sawgrass/wet prairie composed of sawgrass, maidencane, primrose willow, beak rush, mermaid weed, arrowhead, and pickerel weed. One melaleuca forest within the assessment area had a few red bay with a ground cover of royal fern and shield fern. Another had greater than 50 percent coverage of melaleuca with a sawgrass understory.

The WCA 3B Seepage Management Area encompasses approximately 3,335 acres of mixed wetland communities (Table 45-1). More than a third of the site consisted of freshwater marsh/prairie complex, which was composed of sawgrass, maidencane, spikerush, primrose willow, saltbush, dog fennel, swamp fern, duck potato, torpedo grass, and broomsedge. A portion of the site consisted of melaleuca with sawgrass understory. The remaining consisted of dense (greater than 90 percent) melaleuca.

Initial effects analysis for the Broward County Water Preserve Area Project

Wood stork

Four wood stork nesting colonies are known to occur within 15 miles of the Broward County WPA Project footprint. The 2B Melaleuca colony is located approximately 6.5 miles northeast of the C-11 Impoundment. The Tamiami Trail East and Tamiami Trail West colonies are located approximately 13 miles and 14 miles, respectively, south of the WCA 3B Seepage Management Area. The fourth, an unnamed colony, is located approximately 12 miles southwest of the WCA 3B Seepage Management area. Surveys by the State of Florida estimated that 50 nests were constructed at the 2B Melaleuca colony and 1,400 nests were constructed at the Tamiami Trail West colony in both 2000 and 2001. No data is available for the Tamiami Trail East colony or the unnamed colony.

No known surveys exist for the project area; however, using FLUCCS data sets (FDOT 1995) and digital aerial photographs, it was determined that approximately 4,466 acres of wetlands containing potentially suitable foraging habitat exists within the WPA Project footprint.

Harm: The entire Broward WPA project is within the CFA of the four wood stork colonies mentioned above (Fig. 45-6). Thus, by altering the hydroperiods of existing wetlands and maintaining water levels above the optimal feeding depth of 15 inches (Coulter and Bryan 1993) for extended periods of time, the project will result in the loss of 2,695 acres (1,189 acres within the C-11 Impoundment and 1,506 acres within the C-9 Impoundment) (Table 45-2). Project actions within the WCA 3A/3B seepage management areas would not reduce wood stork foraging habitat.

Actions that would allow for the periodic dry down of areas within the C-11 and C-9 may limit the impact and subsequent loss of foraging areas available to wood storks. Dry downs are especially important during peak nesting season (January - July) when less travel time between feeding and nesting sites is important to chick survival (Kahl 1964).

The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning.

Benefit: Wood storks may find infrequent foraging opportunities along canal edges and around the perimeter of the C-11 and C-9 reservoirs; however, this benefit likely will be negligible since the water will typically be too deep or the edges too steep for wood storks to forage efficiently.

Other Benefits: Features that could potentially benefit wood storks have been incorporated into the WPA project design. These features, however, are compensation for the loss of existing wetland mitigation due to the WPA project and should not be counted as benefits as a result of the CERP. Mitigation features that could potentially increase foraging opportunities for wood storks include 10.1 acres of littoral shelves within the seepage canals of the C-11 Impoundment, and 10.6 acres of littoral shelves within the seepage canals of the C-9 Impoundment. According to the proposed design, a shelf approximately 30 feet wide with depths of up to 2 feet would be constructed outside of the water conveyance area. Prey must be concentrated in relatively high densities for wood storks to forage efficiently (Service 1999a); therefore, if the littoral shelves are to provide benefit to wood storks, they should be constructed according to the guidance provided in the Service's Planning Aid Report (Service 1999b).

Eastern indigo snake

No known surveys exist for the project area; however, based on the snake's ability to utilize a variety of altered and unaltered habitats, it can be assumed that the snake uses habitat within the project area. Using FLUCCS (FDOT 1995) GIS data sets, and digital aerial photographs, it was determined that approximately 6,399 acres of potential indigo snake habitat exists within the WPA project footprint.

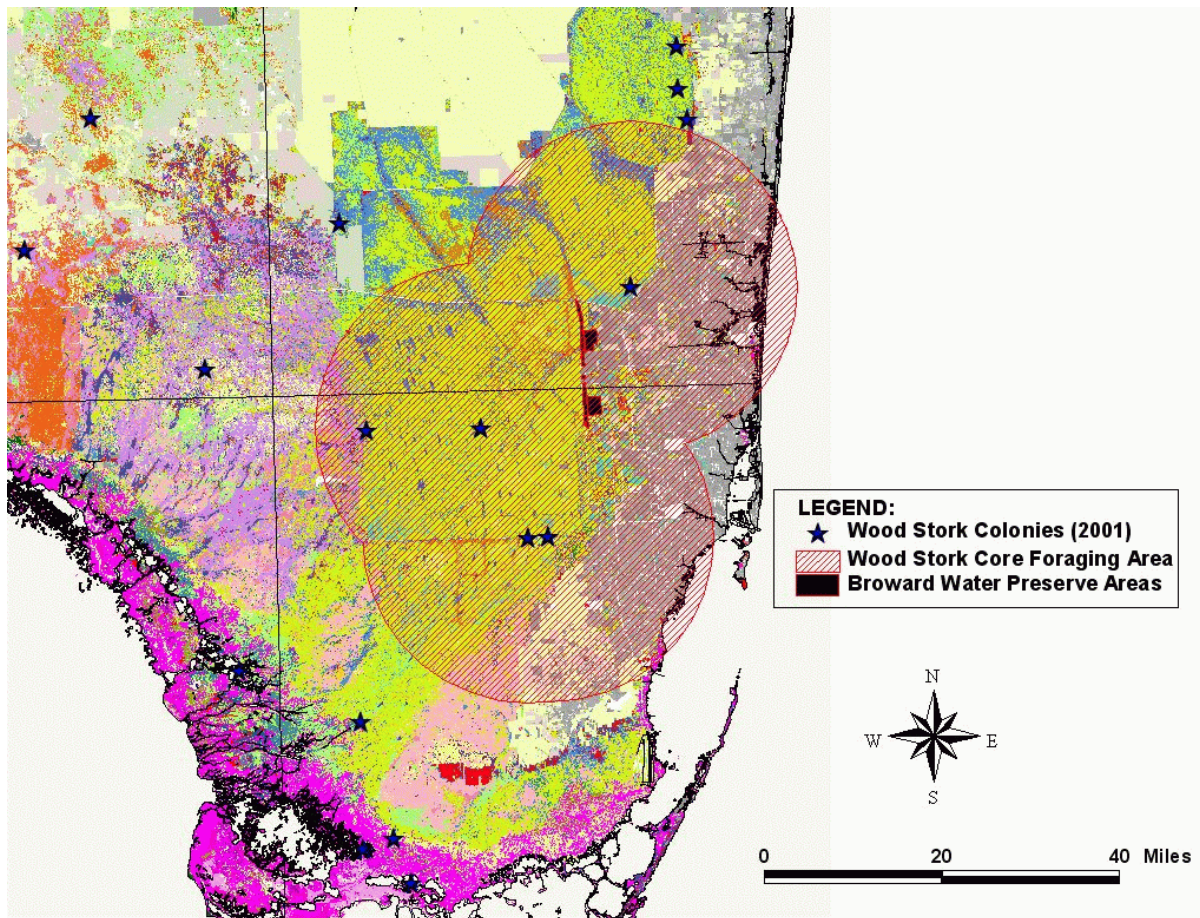


Figure 45-6. Core Foraging Area of wood stork colonies within 15 miles of the Broward County Water Preserve Areas.

Harm: The conversion of mixed upland and wetland habitats to deepwater reservoirs will result in the loss of approximately 3,622 acres of potential indigo snake habitat (1,772 acres within the C-11 Impoundment and 1,850 acres within the C-9 impoundment) (Table 45-2). During construction, most project features will be accessed using existing county and state roads but some may require the construction of new service roads that may increase road-related mortality of indigo snakes. Additionally, new levees will be constructed for the projects and many will double as access or maintenance roads. Indigo snakes may also be directly harmed or harassed during construction activities. To minimize potential adverse effects to the species, it will be necessary to incorporate the Service's *Standard Protection Measures for the Eastern Indigo Snake* into the project design.

Benefits: The C-11 Impoundment is designed with a 36,430-foot perimeter levee. The wetland buffer area within the impoundment is designed with a 11,230-foot perimeter levee. Another 1,075-foot perimeter levee will be constructed around the S-504 Discharge Pool at the

southwestern corner of the impoundment. These newly constructed levees will provide foraging and resting habitat for indigo snakes. All of the levees (a total of 48,735 feet) are designed to have a top width of 12 feet. To estimate the potential gain in habitat, levee lengths were converted to acres by multiplying the lengths by the top width. Because water levels will fluctuate and likely not reach the tops of the levees, 3 additional feet were added to the widths prior to calculation to account for the potential habitat on the sides of the levees. The potential created snake habitat was estimated to be 16 acres (Table 45-2).

Table 45-2. Land use practices and acres of potential Threatened and Endangered species habitat within the Broward County Water Preserve Areas. Land use practices were determined using FLUCCS GIS data sets (FDOT 1995). Caution should be used when interpreting these data as land use likely has changed since 1995 as a result of urban development, invasion by exotic plant species, and natural ecological processes.

Land Use	Acres of Habitat Impacted or Improved				
	Wood Stork	Indigo Snake	Manatee	Snail Kite	Bald Eagle
Fixed Single Family Units		-43.5	n/a	n/a	n/a
Freshwater Marshes	-222.6	-222.6	n/a	n/a	n/a
Freshwater Marshes - Sawgrass	-		n/a	n/a	n/a
Improved Pastures	-1,496.4	-1,496.4	n/a	n/a	n/a
Melaleuca	-	-363.7	n/a	n/a	n/a
Mixed Hardwoods	-	-10.5	n/a	n/a	n/a
Mixed Wetland Hardwoods	-1.2	-1.2	n/a	n/a	n/a
Mixed Wetland Hardwoods - Mixed Shrubs	-15.5	-15.5	n/a	n/a	n/a
Mixed Wetland Hardwoods - Willows	-1.8		n/a	n/a	n/a
Non-Fruit or Citrus Groves	-	-4.7	n/a	n/a	n/a
Power Lines	-		n/a	n/a	n/a
Rural Land in Transition	-		n/a	n/a	n/a
Spoil Areas	-		n/a	n/a	n/a
Tree Nurseries	-	-472.5	n/a	n/a	n/a
Undeveloped Land within Urban Areas	-		n/a	n/a	n/a
Unimproved Pastures	-959.5	-959.5	n/a	n/a	n/a
Xeric Oak	-	-31.7	n/a	n/a	n/a
Levees	-	35.8	n/a	n/a	n/a
Reservoir Perimeter Habitat	-	-	n/a	10	n/a
New Reservoirs	-	-	n/a	n/a	3,290.0
TOTAL ACRES	-2,695.2	-3,585.9	n/a	10	3,290.0

The C-9 Impoundment is designed with a 34,840-foot perimeter levee having a top width of 12 feet. A 2,060-foot ASR maintenance berm having a top width of 22 feet will be constructed along the northern boundary of the impoundment. These newly constructed levees will provide foraging and resting habitat for indigo snakes. To estimate the potential gain in habitat, levee lengths were converted to acres by multiplying the lengths by the top width. Because water levels will fluctuate and likely not reach the tops of the levees, 3 additional feet were added to the widths prior to calculation to account for the potential habitat on the sides of the levees. The potential created snake habitat was estimated to be 13 acres (Table 45-2).

The WCA 3A Seepage Management Area is designed with 5,390 feet of tie-in and miscellaneous levees with top widths of 12 feet. The WCA 3B Seepage Management Area is designed with two levees to contain canal conveyances and wetlands sheetflow, and one perimeter levee that provides protection for the Holly Lakes Mobile Home Community. The combined length of the levees is 11,345 feet and each has a top width of 12 feet. These newly constructed levees will provide foraging and resting habitat for indigo snakes. To estimate the potential gain in habitat, levee lengths were converted to acres by multiplying the lengths by the top width. Because water levels will fluctuate and likely not reach the tops of the levees, 3 additional feet were added to the widths prior to calculation to account for the potential habitat on the sides of the levees. The potential created snake habitat was estimated to be 6 acres (Table 45-2).

West Indian manatee

Manatees have been documented within the C-11 and C-9 canals (Fig. 45-8) and have been observed as far west as the L-33/L35 levee along the eastern boundary of WCA 3 (Neil Kalin, South Broward Drainage District, personal communication 2003).

Conservation Measures: The WPA project has numerous structures that could be hazardous to manatees during operations. Manatees are known to reach and be killed or injured at inland water control structures. Currently, the Service and the Corps are part of a multi-agency effort reviewing this issue. In the Draft WPA Feasibility Report, the Corps outlined suggested requirements and locations for barriers that would exclude manatees (Table 45-3). Barriers are to be located in the primary canals, which will restrict manatees from areas where several gated structures are to be constructed (Fig. 45-8). In addition, the Service's *Standard Manatee Protection Construction Conditions* will need to be followed in order to reduce potential construction-related effects to the species. Further guidance for structure design and manatee conservation is being developed by a multi-agency team.

Everglade snail kite

Presently, the snail kite is not known to occur within the WPA project area; however, in 1977, portions of the WCA 3 immediately west of project area was designated as critical habitat for the species (50 CFR 17.95).

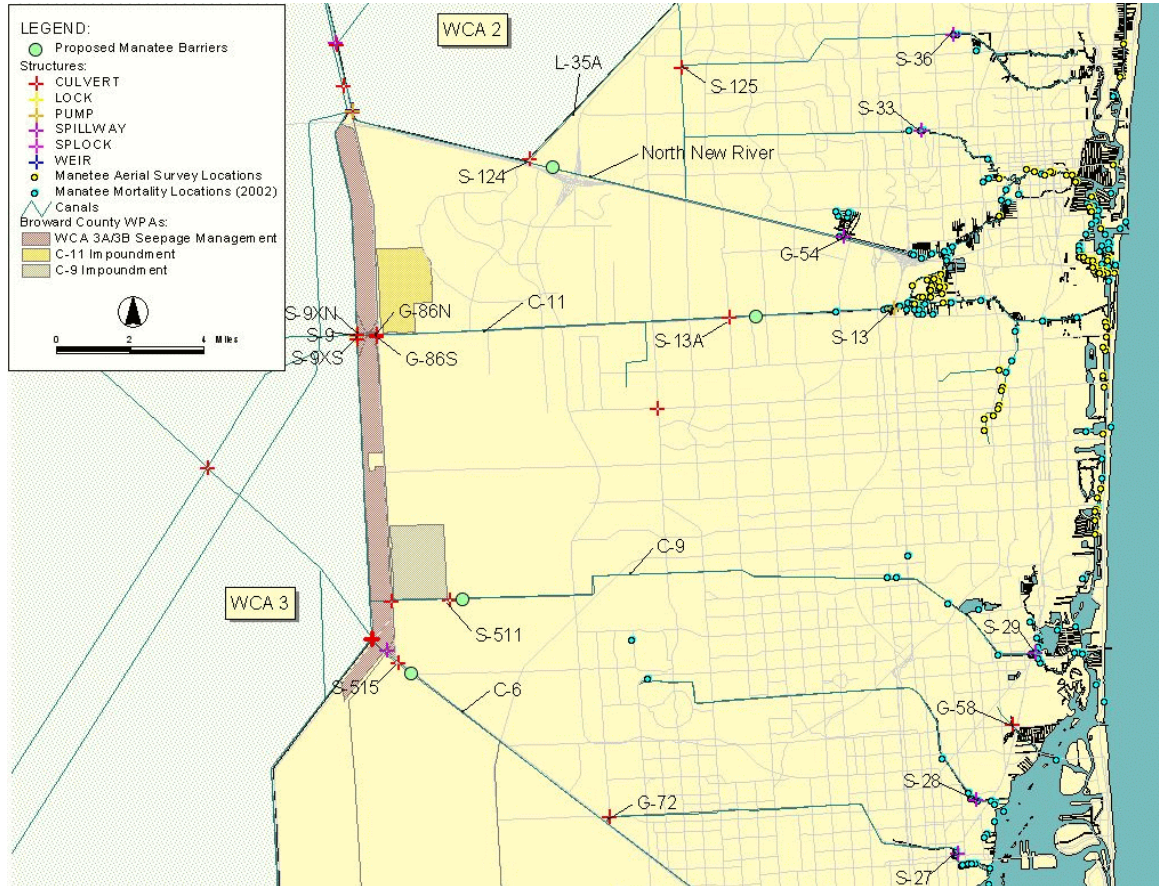


Figure 45-7. Documented locations of manatee mortalities and observations within canals near the Broward County Water Preserve Areas. Approximate locations for barriers that would exclude manatees are to be located in the primary canals to restrict manatees from areas where several gated structures are to be constructed.

Table 45-3. Suggested manatee barrier requirements and locations for the Broward County Water Preserve Areas project.

WPA Project Element	Barrier Locations
C-11 Impoundment	None required - Barrier east of S-13A to be installed for S-381 Critical Project Structure
C-9 Impoundment	Barrier east of new structure S-511 in C-9 Canal
WCA 3A Seepage Management Area	Barrier east of confluence of L35A and North New River in the North New River Canal
WCA 3B Seepage Management Area	Barrier east of new structure S-515 in C-6 Canal

Benefit: With the construction of the C-11 and C-9 Impoundments, some previously unavailable foraging opportunities may exist for kites along the edges of the reservoirs. The potentiality of this habitat is dependent on the presence of apple snails, on which the snail kite feeds almost exclusively. Long hydroperiod wetlands (greater than 1 year) with interspersed emergent vegetation are needed to sustain apple snail populations (Sykes 1979, Beissinger 1988). The presence of apple snails will only benefit the kites if suitable perches around or within the impoundments are available to the birds. If the newly created impoundments produce these requisite conditions, the project has the potential to provide approximately 10 total acres of foraging habitat around the C-11 and C-9 Impoundments (*i.e.*, five acres around each) (Table 45-2).

Bald Eagle

No known eagle nests currently exist in or near the Broward WPA project area. Bald eagles, however, are typically found near large bodies of open water (*e.g.*, estuaries, large lakes, reservoirs, major rivers/canals). Eagles are opportunistic feeders, but in southern Florida the bulk of their diet is fish.

Benefit: The construction of the C-11 and C-9 Impoundments may provide new foraging opportunities for eagles. Approximately 1,490 acres of new habitat will be provided by the C-11 and 1,800 acres will be provided by the C-9. This new habitat will only be available to eagles if water levels are kept at a depth sufficient to sustain populations of large fish and other prey items (*e.g.*, turtles, water-dependent birds).

Protective Measures: Eagles, especially juveniles, perch on power lines and towers, particularly if these structures provide the highest vantage points in the area (Avian Power Line Interaction Committee 1996). Thus, for new structures requiring power near open water (*i.e.*, pump stations) the *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocutions.

Coordination with the Corps and the District for the Broward County Water Preserve Areas

September 5, 2002. WPA PDT meeting announcing separation of project into nine distinct projects/PIRs.

October 2, 2002. Site visit with the District.

November 9, 2002. Project overview meeting with the District.

March 14, 2003. Sent e-mail to Corps requesting project description verification.

March 30, 2003. Received verification of project description from the District.

Section 7 consultation history

On September 23, 2000, the Corps initiated informal section 7 consultation by letter for the original WPA project configuration, which included Broward County Water Preserve Area. The consultation was based on all WPA project components in Palm Beach, Broward, and Miami-Dade Counties, encompassing a significantly larger project description and included effects analysis for threatened and endangered species for all components.

On October 24, 2000, the Service provided a letter to the Corps including a list of species which could be affected by the project. In that correspondence, the Service recommended that the Corps continue informal consultation throughout the preliminary planning process as design iterations were evaluated.

On March 21, 2001, following selection of the plan, the Corps forwarded a Biological Assessment by letter. The Biological Assessment considered potential effects on the following species: West Indian manatee, snail kite, wood stork, Cape Sable seaside sparrow, and eastern indigo snake. The Corps determined that the WPA project is not likely to adversely affect any of the considered species or adversely modify critical habitat.

On April 18, 2001, the Service concurred by letter with the Corps' determination. This concurrence covered the physical layout of the selected plan and considered the range of operations as modeled in the PSP and PSPS 1234 regional water model simulations. The Service recommended reinitiation of consultation on the snail kite, wood stork, and Cape Sable seaside sparrow once a more detailed operational plan is proposed for the WPA project.

46 C-4 Structure

C-4 Structure project description

The C-4 Structure (S-380E) is located in Miami-Dade County on the C-4 canal just east of the confluence of C-2 (Fig. 46-1). The Snapper Creek and C-4 canals are in a densely populated area known as Sweetwater (Figs. 46-2a-2b). As described in the Restudy and the Draft WPA Feasibility Report, S-380E will divert dry season flows from the western C-4 basin and Snapper Creek to the C-2 canal when it is in the raised position. The area experiences flooding during large storm events and is currently being studied by Miami-Dade County for stormwater drainage enhancement. Hydraulically, the C-4 and C-2 canals are managed at similar control stages by coastal structures downstream of the project location.

The primary objective of S-380E is to direct water south in the C-2 canal for groundwater and well field recharge. The ability to direct flows south in the C-2 canal will also provide more freshwater flows to the central Biscayne Bay area. The structure can also be operated to maximize the flow in both canals during the wet season to optimize flood protection.

The recommended S-380E structure design is an Obermeyer Spillway Gate (Fig. 46-2c). The Obermeyer Spillway Gate system is a patented bottom hinged steel spillway gate panel, lifted and supported on the downstream side by an inflatable air bladder. By controlling the pressure in the bladder, the gate can be infinitely adjusted within the system control range of full inflation to full deflation. The system can be remotely controlled and includes an air compressor, receiver tank, and various control valves for venting of air from the air bladder. All automatic systems include provision for local manual control.

The recommended structure will have a relatively small footprint, which is required due to the limited area at the site (Fig. 46-2a). The inflatable air bladder is protected from vandalism by the gate when deflated and will be below the downstream water surface and out of sight when inflated. The gate can be powered by a 5 horsepower air compressor located in a small out building on the bank within the canal right-of-way. When the air bladder is deflated, the gate fits flush on the canal bottom allowing non-obstructive flow in the canal. When the air bladder is inflated, the gate acts as a canal barrier directing flow south in the C&SF Restudy C-2 canal. Existing roads and levees can be used for structure construction.

Initial effects analysis for the C-4 Structure project

Eastern indigo snake

The indigo snake is a likely inhabitant of the project area, due to potentially suitable habitat. Indigo snakes may be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* will be implemented during project construction and included in the environmental protection plan when the Corps proceeds to the plans and specifications phase for the project. Due to the very small footprint of this project, any habitat loss would be negligible.

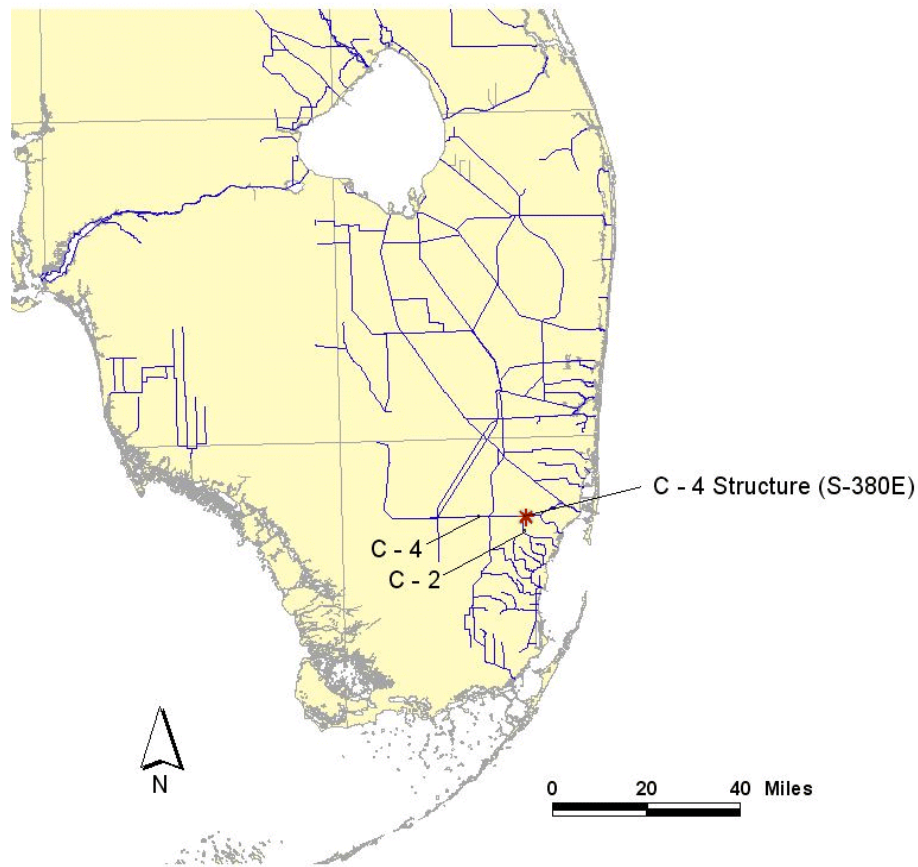


Figure 46-1. Location of C-4 Structure (S-380E) in Miami-Dade County on the C-4 canal just east of the confluence of C-2.

West Indian manatee

Harm: Manatees are known to reach and be killed or injured at inland water control structures, and the Service and Corps are part of a multi-agency effort to eliminate this threat. Manatees are known to use the C-4, C-2 and C-2 extension canals. Construction activities within canals used by manatees may result in disturbance or injury and the Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented in areas accessible to manatees. In Table 8.5-1 of the Draft WPA Feasibility Report, the Corps outlines manatee barrier requirements and locations. The suggested barrier is listed under the Dade-Broward Levee and Canal Separable Element because it was once considered part of that project. Although this barrier (east of the new structure S-519 in the C-4 canal) and one east of the S-380E were suggested, the Service recommends that multiple canal usage in the project area requires reconsideration of a manatee-friendly structure in lieu of multiple barriers that may lead to entrapment and/or death. Further guidance for structure design and manatee conservation for CERP is being developed by a multi-agency team.

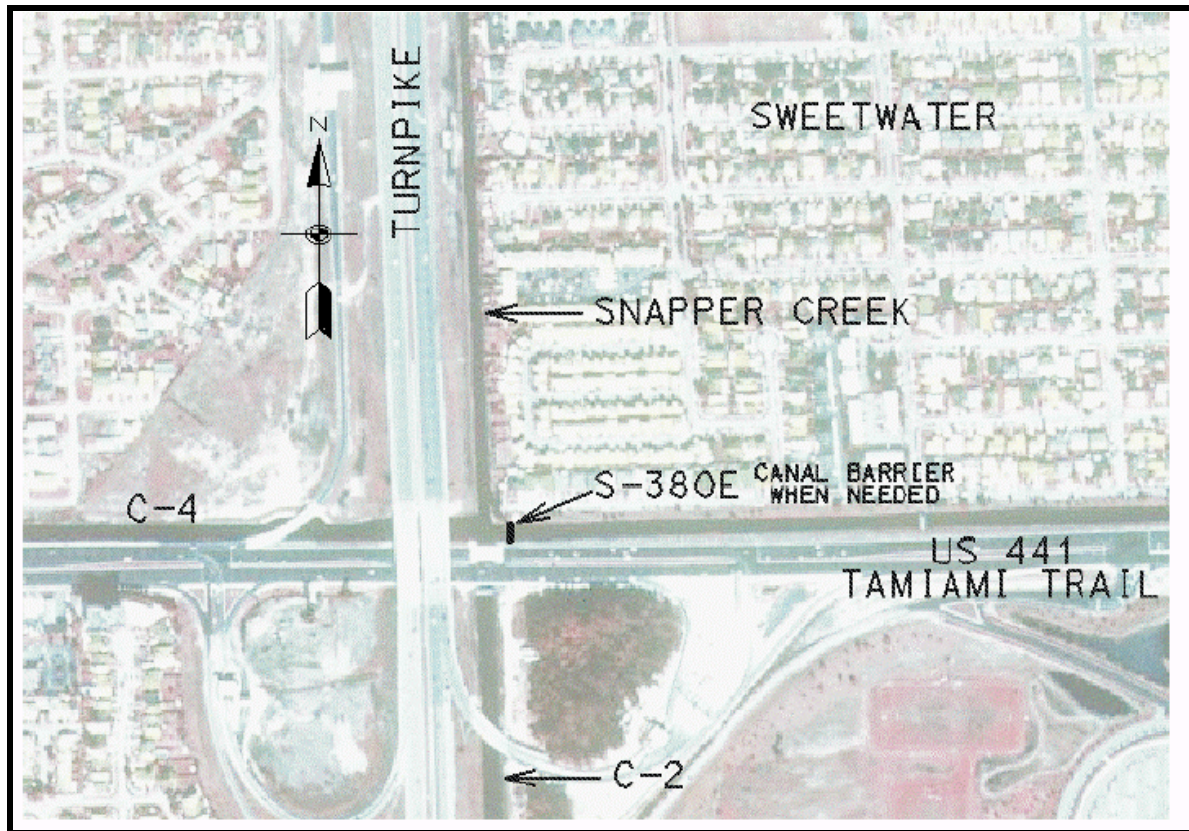


Figure 46-2a. The C-4 Structure (S-380E) is located near the Snapper Creek and C-4 canals in a densely populated area known as Sweetwater (Figure B.9.2.3.1-1, Corps 2001).

Coordination with the Corps and the District for the C-4 Structure project

September 5, 2002. WPA PDT meeting announcing separation of project into nine distinct projects/PIRs.

October 2, 2002. Site visit with the District.

November 9, 2002. Project overview meeting with the District.

February 24 and 28, 2003. Sent e-mail to Corps requesting project description verification.

February 24, 27 and 28, 2003. Sent e-mail to the District requesting projects description verification.

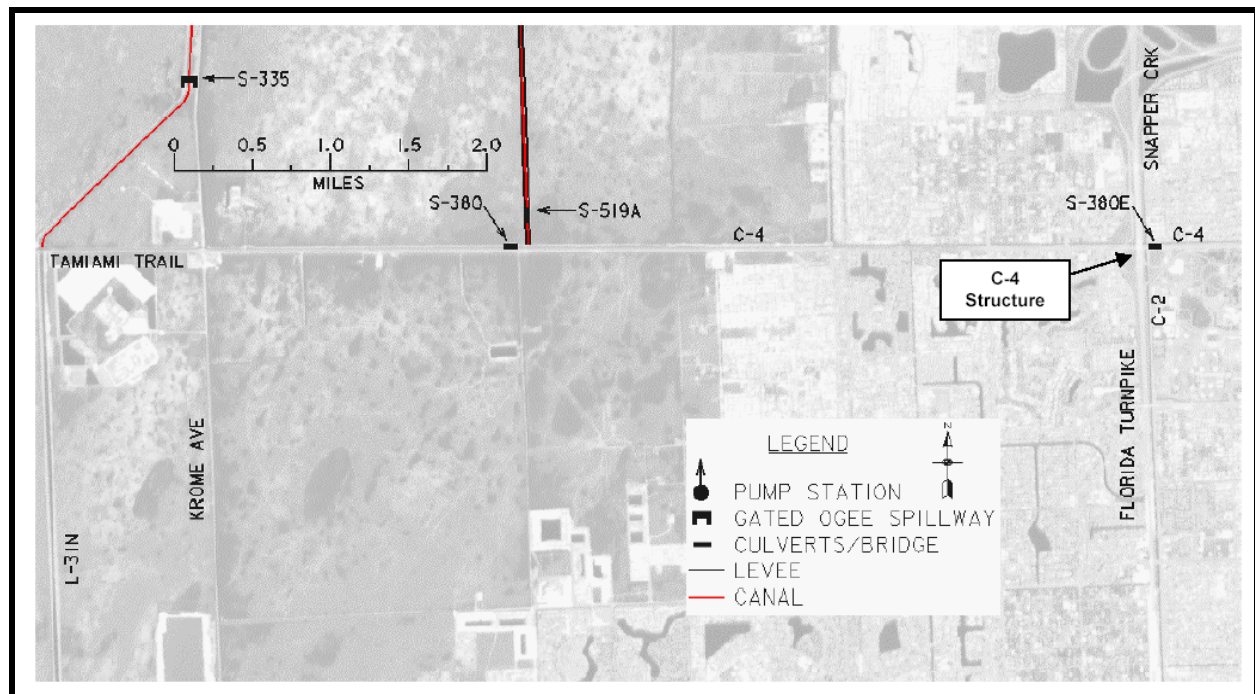


Figure 46-2b. Location of C-4 Structure (S-380E) in Miami-Dade County (Figure 8.1-9, Corps 2001).

Section 7 consultation history

On September 23, 2000, the Corps initiated informal section 7 consultation by letter for the original WPA project configuration, which included C-4 Structure. The consultation was based on all WPA project components in Palm Beach, Broward, and Miami-Dade Counties, encompassing a significantly larger project description and included effects analysis for threatened and endangered species for all components.

On October 24, 2000, the Service provided a letter to the Corps including a list of species which could be affected by the project. In that correspondence, the Service recommended that the Corps continue informal consultation throughout the preliminary planning process as design iterations were evaluated.

On March 21, 2001, following selection of the plan, the Corps forwarded a Biological Assessment by letter. The Biological Assessment considered potential effects on the following species: West Indian manatee, snail kite, wood stork, Cape Sable seaside sparrow, and eastern indigo snake. The Corps determined that the WPA project is not likely to adversely affect any of the considered species or adversely modify critical habitat.

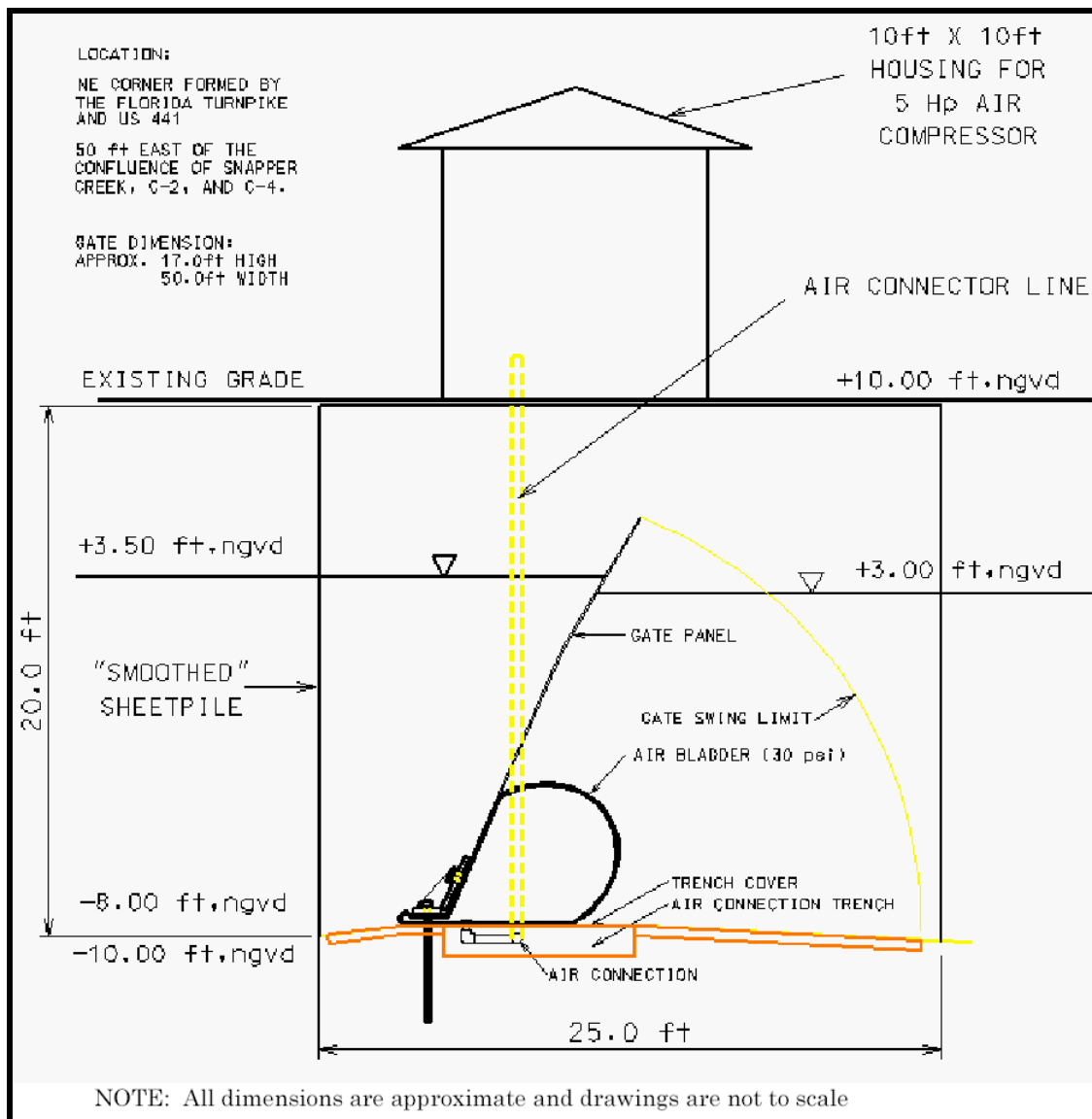


Figure 46-2c. S-380E Installation - typical section of Obermeyer spillway gate (Figure B.9.2.3.1-2, Corps 2001).

On April 18, 2001, the Service concurred by letter with the Corps' determination. This concurrence covered the physical layout of the selected plan and considered the range of operations as modeled in the PSP and PSPS 1234 regional water model simulations. The Service recommended reinitiation of consultation on the snail kite, wood stork, and Cape Sable seaside sparrow once a more detailed operational plan is proposed for the WPA project.

47 Water Conservation Area 3A/3B Flows to Central Lake Belt

WCA 3A/3B Flows to Central Lake Belt project description

This component, a gated culvert (S-501) located in western Broward County (Fig. 47-1), captures excess water in WCA 3A/3B and diverts it through the S-501 structure and S-31 to the Central Lake Belt Storage Area via the improved L-37 and improved L-33 borrow canals. S-501 is located immediately north of the S-9 and S-9A pump stations on the L-37 levee (Fig. 47-2). This culvert will manage the diversion of WCA 3 water to the Central Lake Belt Storage Area or Northeast Shark River Slough (on an interim basis), reducing above target stages. This is a change from the Draft WPA Feasibility Report which described the modification of structures S-9, located in the L-37 levee, and S-31, located in the L-33 levee. Neither the S-31 or the S-9 will require modification for this project (M. Day, District, personal communication 2003)

As described in the Draft WPA Feasibility Report, the S-501 is a three-barrel, gated culvert structure. The design flow is 500 cfs with a hydraulic head of 1.5 feet. The culvert barrels are round reinforced concrete pipe 6 feet in diameter and 110 feet in length. The barrel invert is set at an elevation of -1.50 feet NGVD.

Site Access: Access to the project area has not been designed at this time. Existing county and state roads provide access to the region. Structures located in a levee will be accessed along the levee top.

Initial effects analysis for the WCA 3A/3B Flows to Central Lake Belt project

Eastern indigo snake

The presence of the indigo snake in the WPA's is likely, due to the presence of potentially suitable habitat. Indigo snakes may be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* will be implemented during project construction and included in the environmental protection plan when the Corps proceeds to the plans and specifications phase for the project. Due to the very small footprint of this project any habitat loss would be negligible.

West Indian manatee

Manatees are known to reach and be killed or injured at inland water control structures, and the Service and Corps are part of a multi-agency effort to eliminate this threat. Manatee infrequently use the L-33 and L-37 canals. Construction activities within these canals may disturb or injure manatees. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented in areas accessible to manatees. The S-501 culvert should be fitted with a grate blocking manatee access as appropriate and according to culvert guidelines. Further guidance for structure design and manatee conservation is being developed by a multi-agency team.

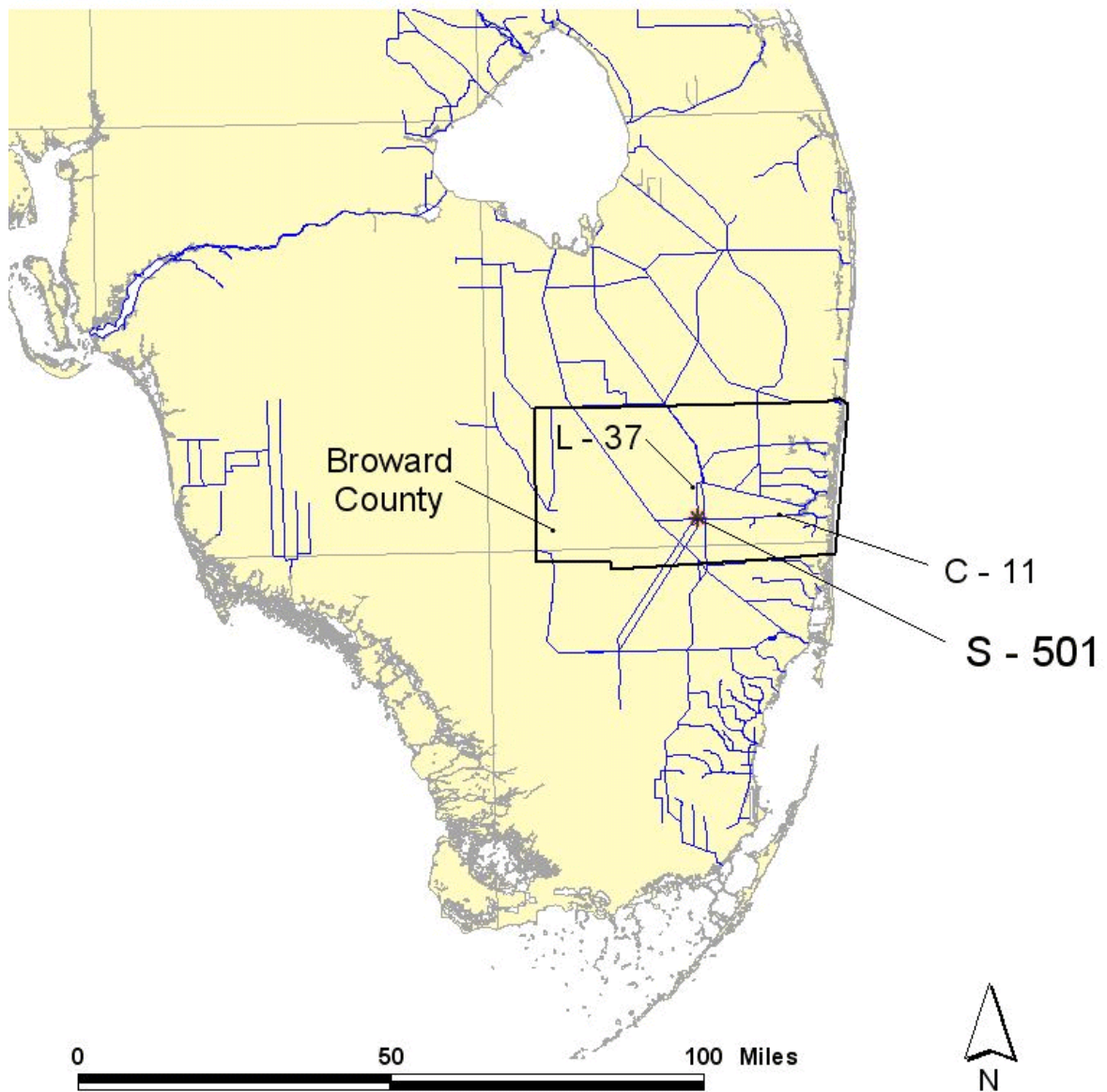


Figure 47-1. Location of Water Conservation Area 3A/3B Flows to Central Lake Belt project.

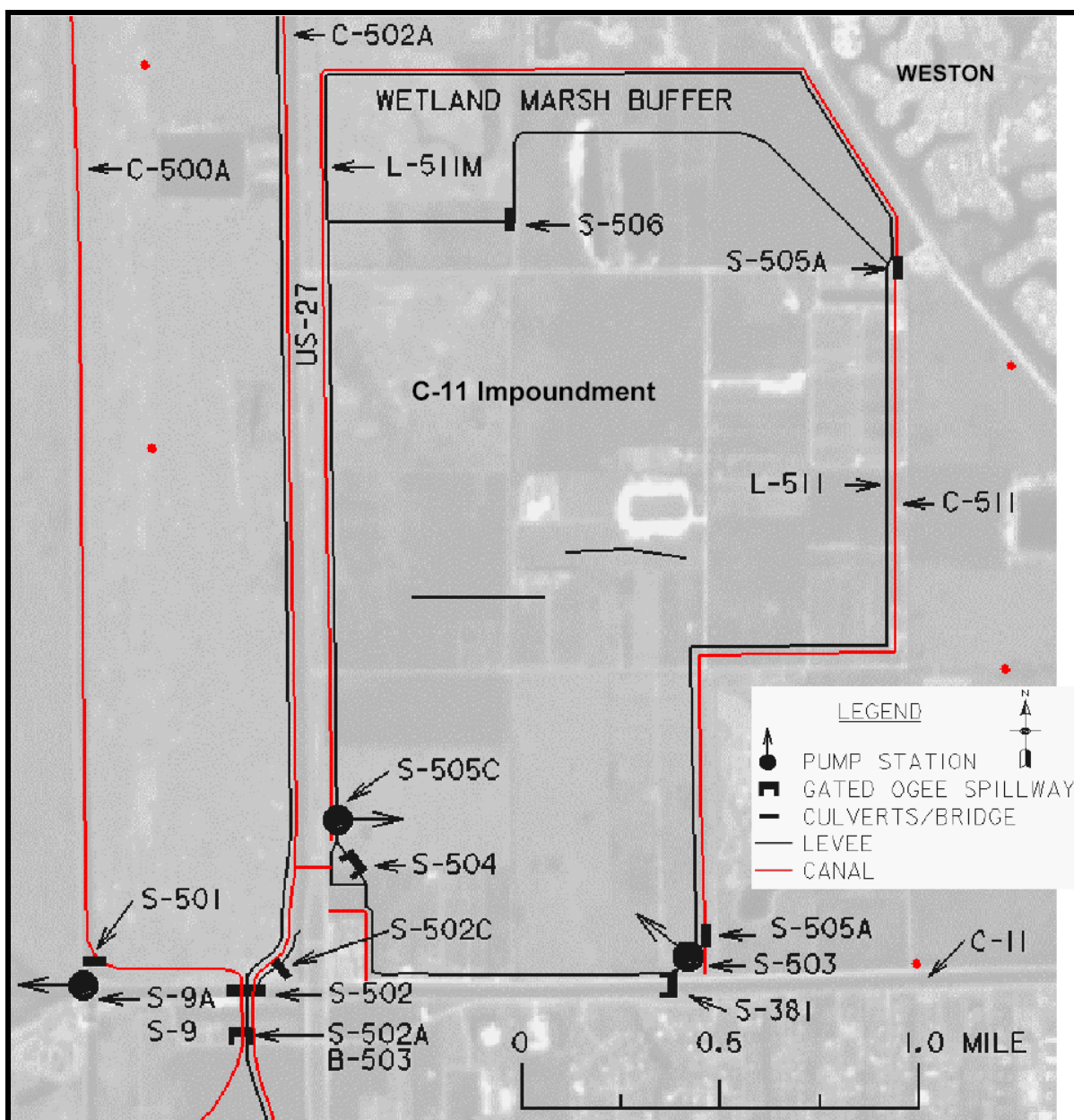


Figure 47-2. S-501 Structure location (Figure 8.1-4, Corps 2001).

Coordination with the Corps and the District for the WCA 3A/3B Flows to Central Lake Belt project

September 5, 2002. WPA PDT meeting announcing separation of project into 9 distinct projects/PIRs.

October 2, 2002. Site visit with the District.

November 9, 2002. Project overview meeting with the District.

March 24 and 26, 2003. E-mail to the Corps pertaining to project description.

March 4 and 14, 2003. E-mail to the District pertaining to project description.

Section 7 consultation history

On September 23, 2000, the Corps initiated informal section 7 consultation by letter for the original WPA project configuration, which included WCA 3A/3B Flows to Central Lake Belt. The consultation was based on all WPA project components in Palm Beach, Broward, and Miami-Dade Counties, encompassing a significantly larger project description and included effects analysis for threatened and endangered species for all components.

On October 24, 2000, the Service provided a letter to the Corps including a list of species which could be affected by the project. In that correspondence, the Service recommended that the Corps continue informal consultation throughout the preliminary planning process as design iterations were evaluated.

On March 21, 2001, following selection of the plan, the Corps forwarded a Biological Assessment by letter. The Biological Assessment considered potential effects on the following species: West Indian manatee, snail kite, wood stork, Cape Sable seaside sparrow, and eastern indigo snake. The Corps determined that the WPA project is not likely to adversely affect any of the considered species or adversely modify critical habitat.

On April 18, 2001, the Service concurred by letter with the Corps' determination. This concurrence covered the physical layout of the selected plan and considered the range of operations as modeled in the PSP and PSPS 1234 regional water model simulations. The Service recommended reinitiation of consultation on the snail kite, wood stork, and Cape Sable seaside sparrow once a more detailed operational plan is proposed for the WPA project.

WCA 2B Flows to ENP project description

As described in the Restudy and the Draft WPA Feasibility Report, this project includes two components: WCA 2B Flows to Central Lake Belt Storage Area and Central Lake Belt Storage Area (L-30 Improvements). The project is located adjacent to WCA 2 and 3 in Broward County (Fig. 48-1) and includes pumps, water control structures, canals, and conveyance improvements.

WCA 2B Flows to Central Lake Belt Storage Area

The purpose of this component is to attenuate high stages in WCA 2B and divert this excess water primarily to Northeast Shark River Slough (to meet demands), and eventually to the Central Lake Belt Storage Area for storage. A 1,500-cfs pump station, culverts, and a new canal will be required to divert excess flows from the L-35 borrow canal. Improvements also will be made to the L-37 and L-33 borrow canals to accommodate flows of 2,000 cfs to Northeast Shark River Slough or to the Central Lake Belt Storage Area.

Newly constructed canal reaches combined with an enlargement of the existing L-37 borrow canal will improve the L-37 borrow canal (renamed C-500A) to accommodate excess flows (Figs. 48-2a-2b). The canal reach starts at S-500C north of I-75 and under U.S. 27, runs westerly to S-500B under I-75 and then southeast to the S-500 pump station for lifting. The pump station provides hydraulic lift for gravity conveyance to WPA targets dependent on demands. The improved L-37 borrow canal also receives water from WCA 3A via S-501 (a 500-cfs gated culvert structure) located near the downstream endpoint with a total capacity of 2,000 cfs for further southbound conveyance (1,500 cfs + 500 cfs total capacity). From S-501, the canal makes a 90° bend to the east and then another 90° bend south over the S-502 inverted siphon structure in the C-11 canal to the S-502A gated spillway structure. The canal stage is maintained by S-502A when deliveries are not being made.

Side casting was assumed in the Restudy for cost effectiveness. Spoil material from canal excavation will be side cast, shaped and maintained on lands adjacent to the canal. A 30-foot setback from the canal edge is implemented for operating excavation and mound shaping equipment. The footprint will effect 122 acres of freshwater marsh.

The improved L-33 borrow canal (Figs. 48- 2c-2d) consists of a newly constructed conveyance canal reach combined with the enlargement of the existing L-33 borrow canal. The canal conveyance capacity is 2,000 cfs from gated spillway S-502A to gated spillway S-32. The canal reach starts at S-502A south of C-11 canal, runs southwestwardly to the L-33 Borrow canal where it continues southward parallel to the L-33 levee to S-32.

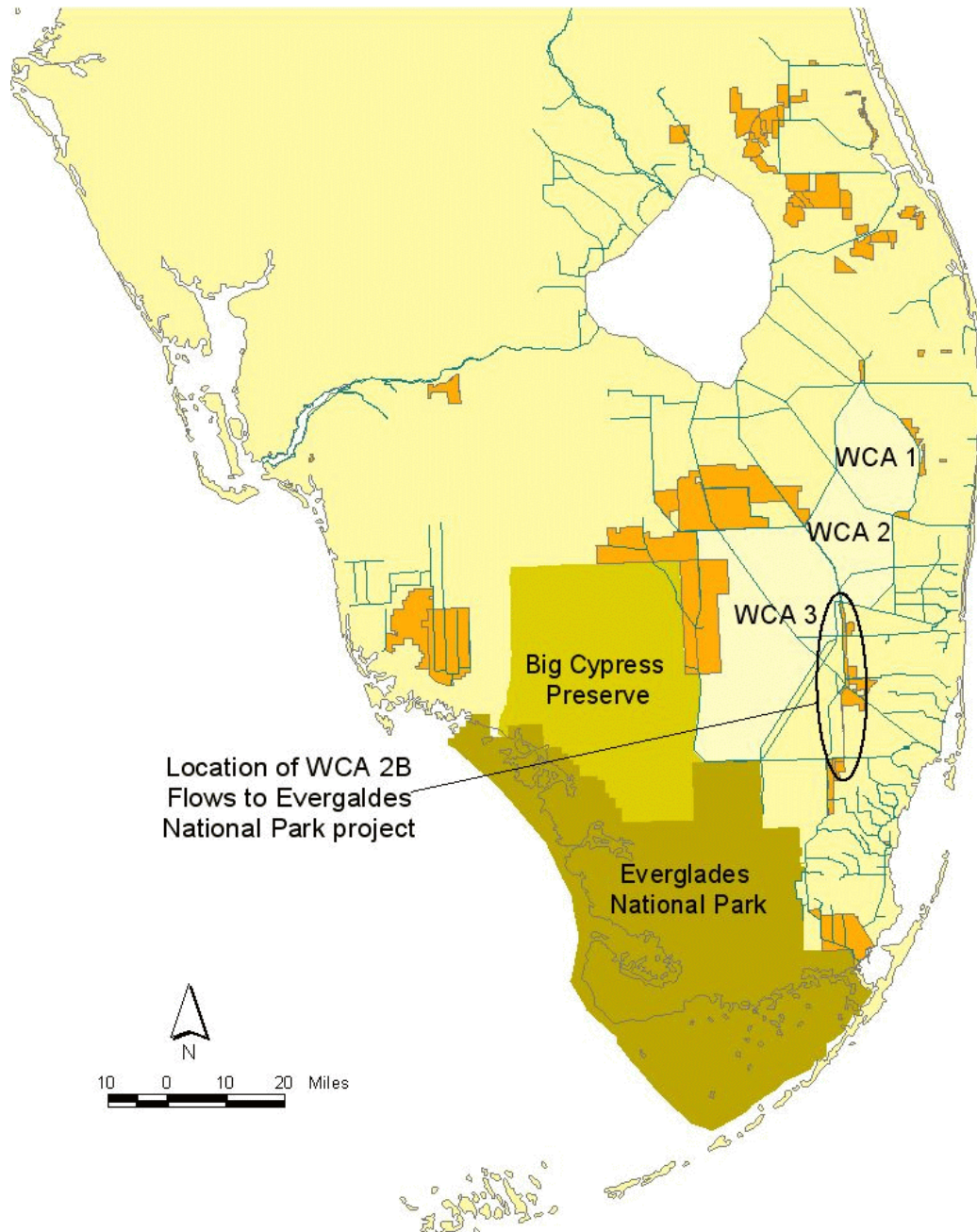


Figure 48-1. Location of Water Conservation Area 2B Flows to Everglades National Park project component of the Comprehensive Everglades Restoration Plan.

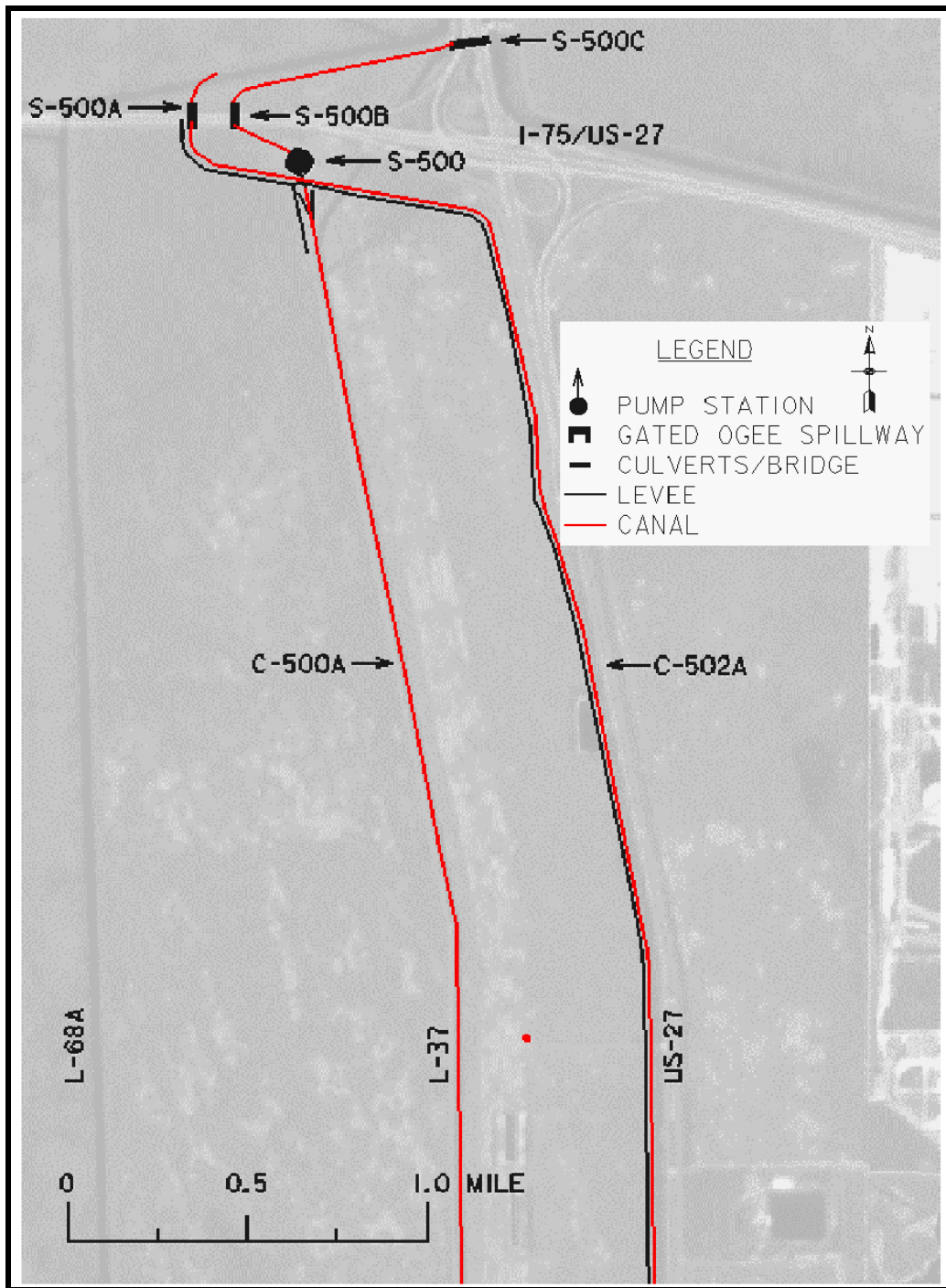


Figure 48-2a. Design and project features of Water Conservation Area 2B Flows to Central Lake Belt Storage Area Comprehensive Everglades Restoration Program component (Figure 8.1-3, Corps).

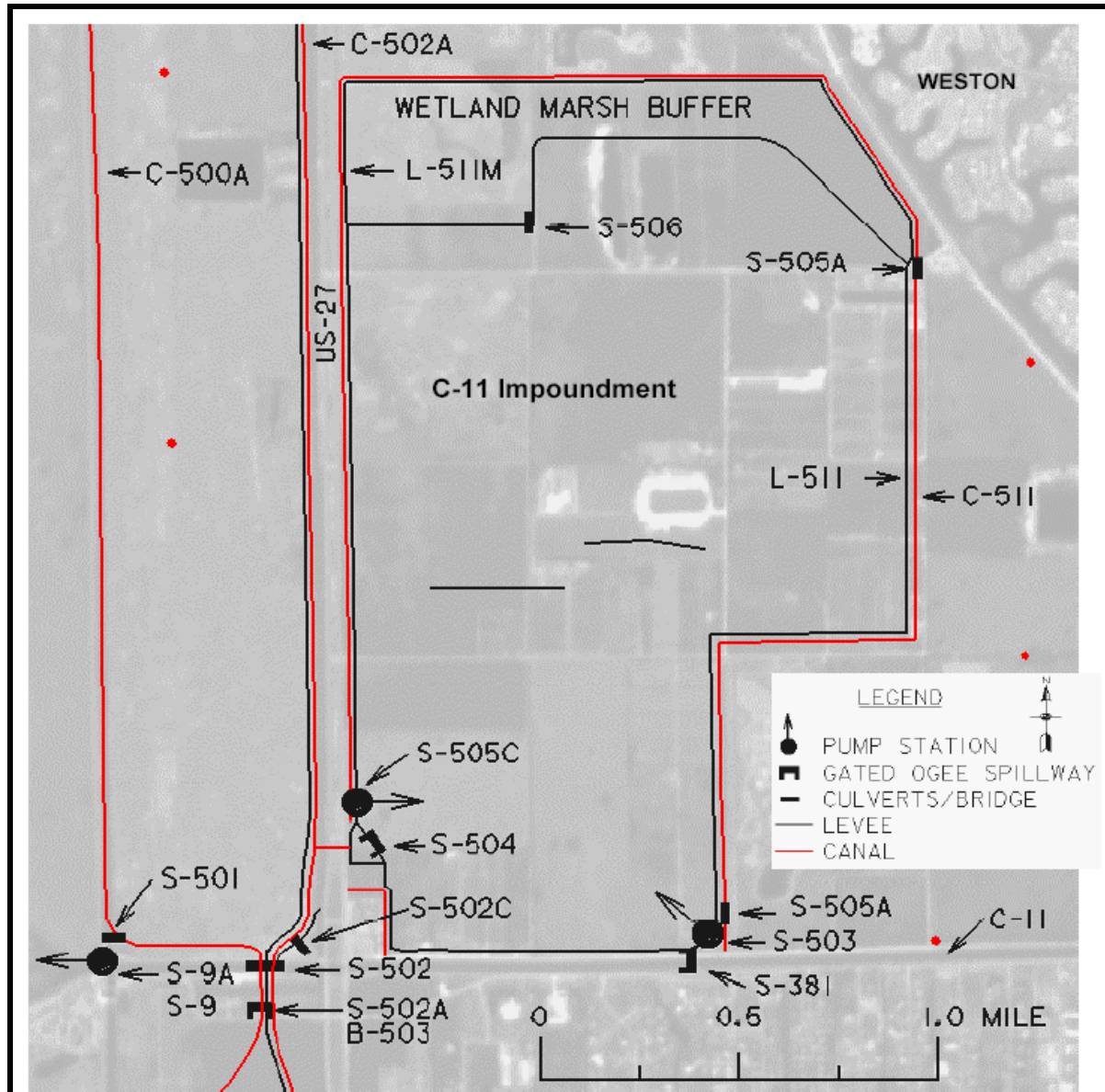


Figure 48-2b. Design and project features of Water Conservation Area 2B Flows to Central Lake Belt Storage Area Comprehensive Everglades Restoration Program component (Figure 8.1-4, Corps 2001).

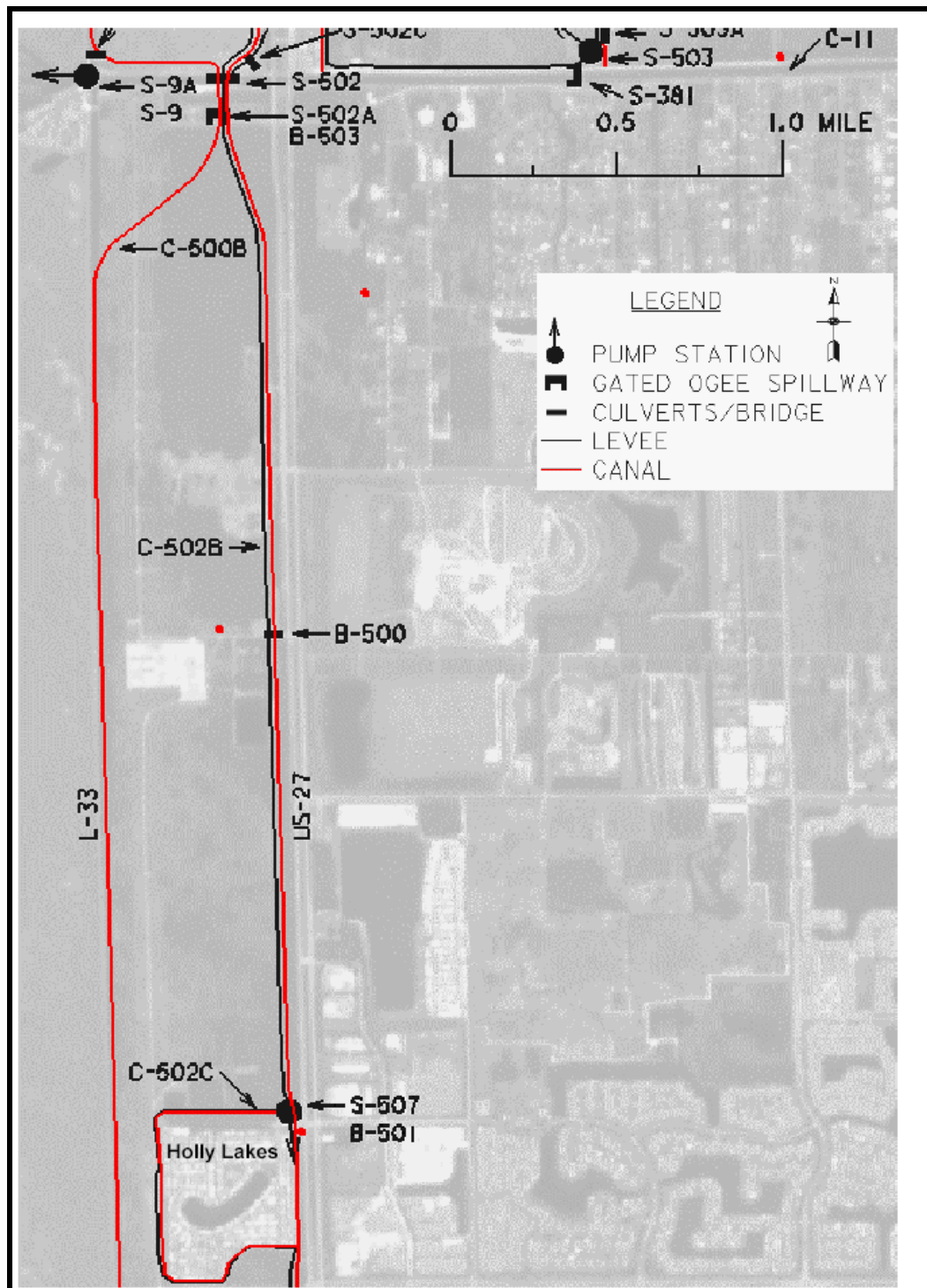


Figure 48-2c. Water Conservation Area 2B Flows to Central Lake Belt Storage Area project features (Figure 8.1-5, Corps 2001).

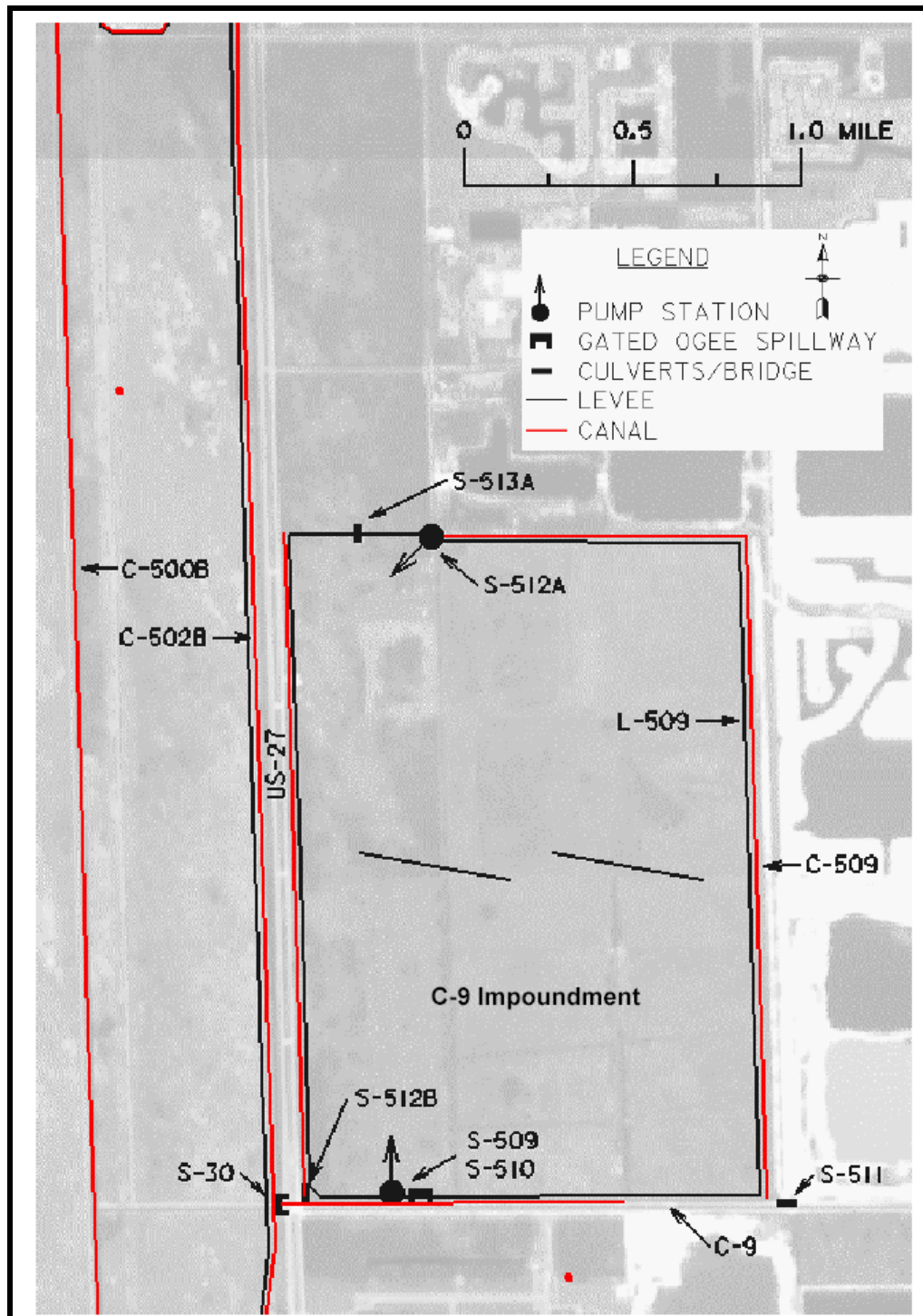


Figure 48-2d. Water Conservation Area 2B Flows to Central Lake Belt Storage Area project features (Figure 8.1-6, Corps 2001).

Side casting was assumed in the Restudy for cost effectiveness. Spoil material from canal excavation will be side cast, shaped and maintained on lands adjacent to the canal. A 30-foot setback from the canal edge is implemented for operating excavation and mound shaping equipment. Canal construction effect will be 170 acres of freshwater marsh.

The S-500 pump station is a conveyance lifting pump for deliveries from WCA 2B targeted for the Northeast Shark River Slough or for the Central Lake Belt Storage Area. The pump station provides a total pumping capacity of 1,500 cfs. It is located on the south side and adjacent to I-75. The pump station raises canal elevations for gravity flow conveyance to final destination points. The S-500 pump station is a 4-bay pump plant with 2 500-cfs and 2 250-cfs diesel engine driven pumps. The deliveries for Northeast Shark River Slough and Central Lake Belt Storage Area may require use of all four pumps, dependent on WCA 2B water availability. For operational flexibility any combination of pumps can be used to maintain optimum delivery rates and canal stages. We have assumed that the pump station will effect approximately 2.5 acres of disturbed upland habitat.

Central Lake Belt Storage Area (L-30 Improvements)

The L-30 borrow canal (Figs. 48-3a-3b), located in Miami-Dade County, will be upgraded to convey 2,000 cfs. The purpose for this improved canal is to convey regional natural system deliveries to Northeast Shark River Slough. The improved L-30 borrow canal also maintains one of the existing purposes of the L-30 borrow canal in reducing seepage loss from WCA 3B by maintaining a higher control elevation when deliveries are not being made.

This constitutes a change from the existing L-30 borrow canal purpose which is to make dry-season deliveries to the South Dade Conveyance System via L-31N south of U.S. 41 (Tamiami Trail). This conveyance purpose of the L-30 borrow canal will be supplanted by the improved Dade Broward Levee Canal or the existing Dade-Broward Levee Canal. The Central Lake Belt Storage Area (L-30 Improvements) design is shown in Figures 48-3a-3c.

The canal reach starts at the C-6 Canal (Miami Canal) and runs south between L-30 and S.R. 997 (Krome Avenue) to a gated spillway structure (S-335) (Fig. 48-3c). The canal will eventually be connected to the scheduled Modified Water Deliveries Project S-356 pump station for discharging deliveries into Northeast Shark River Slough. The improved L-30 borrow canal control stages north of S-335 will be managed between 6.00 and 7.00 feet NGVD when deliveries are not being made. The water source to maintain the stages will be mainly comprised of seepage loss from WCA 3B. Backwater calculations for deliveries showed canal elevations ranging from 5.30 feet NGVD at the headwater of S-335 (downstream) to 6.25 feet NGVD at the tail water of S-32 (upstream).

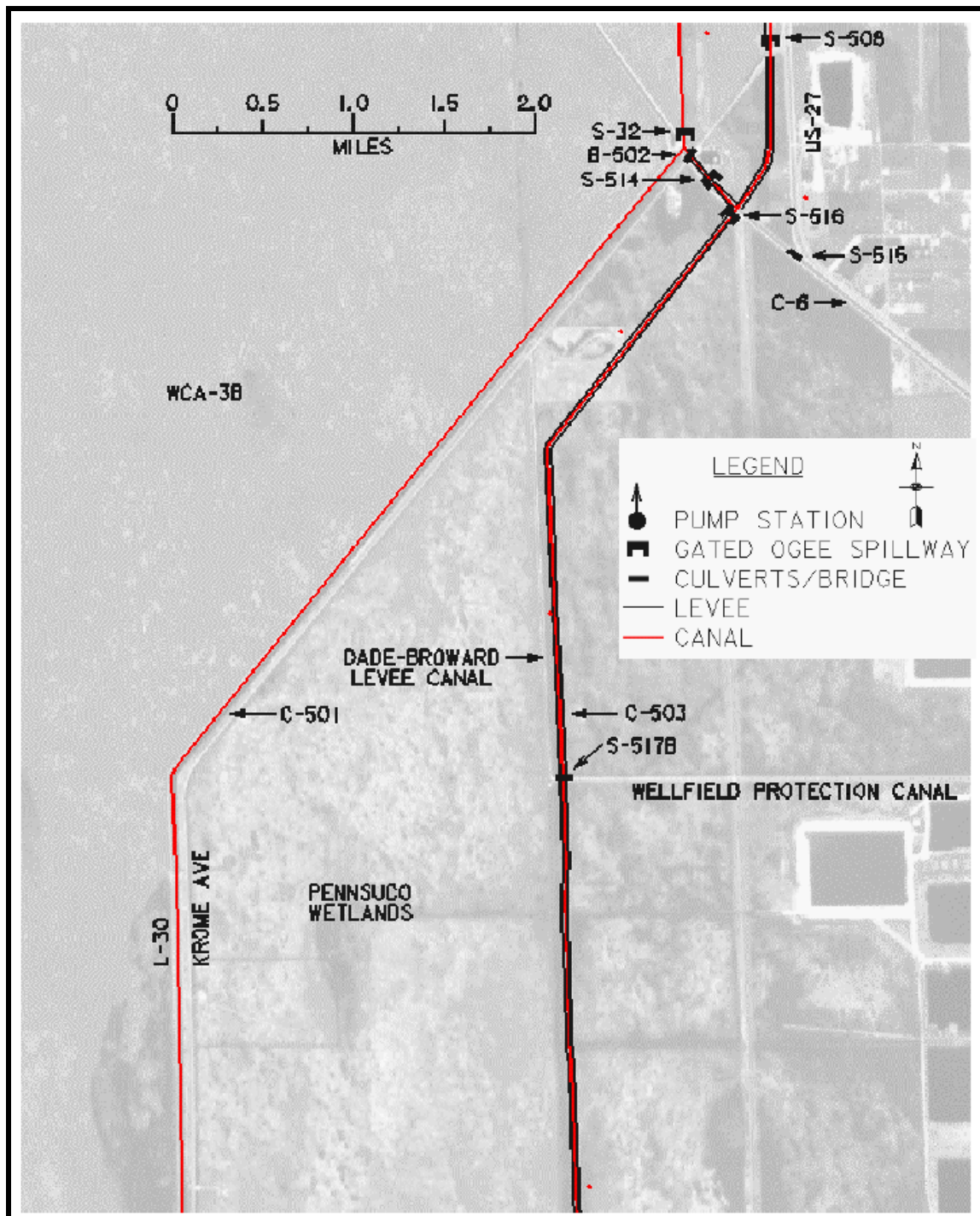


Figure 48-3a. L-30 Improvements/C-501 (Figure 8.1-7, Corps 2001).

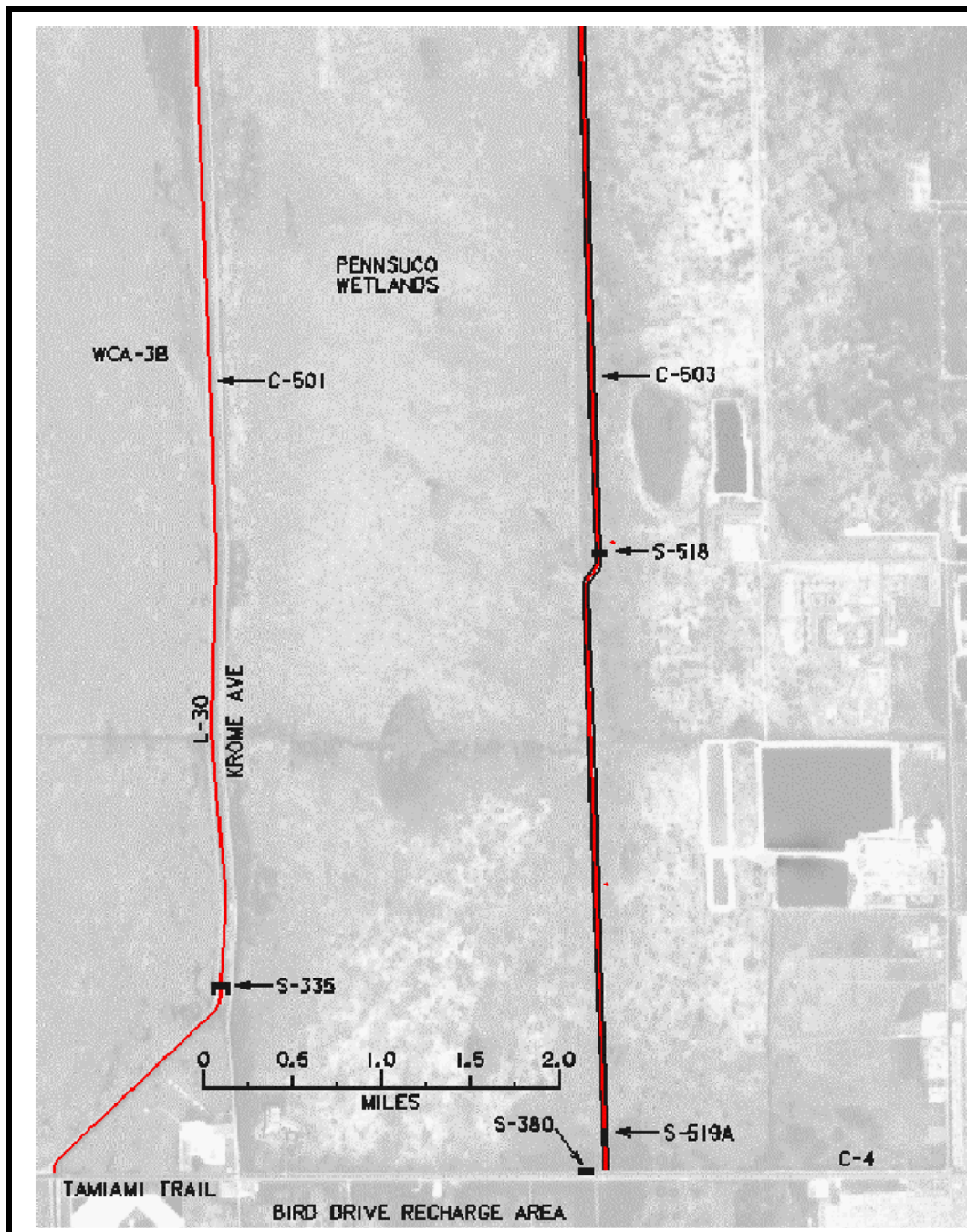


Figure 48-3b. L-30 Improvements/C-501 (Figure 8.1-8, Corps 2001).

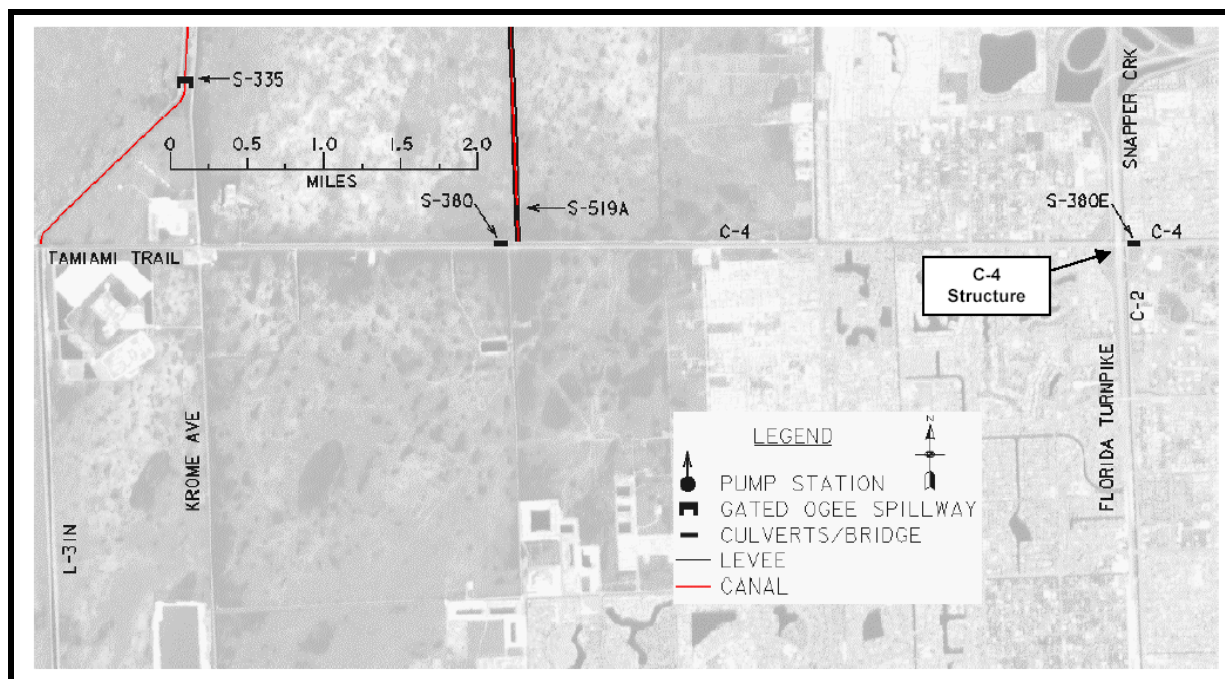


Figure 48-3c. L-30 Improvements/C-501 (Figure 8.1-9, Corps 2001).

Side casting was assumed in the Restudy for cost effectiveness. Spoil material from canal excavation will be side cast, shaped, and maintained on lands adjacent to the canal. A 30-foot setback from the canal edge is implemented for operating excavation and mound shaping equipment. The footprint effect will be a total of 273 acres of freshwater marsh. Access to the project area has not been designed at this time. Existing county and state roads provide access to the region. Structures located in a levee will be accessed along the levee top.

Initial effects analysis for the WCA Flows to ENP

FLUCCS codes (FDOT 1995) were used to estimate habitat potentially used by threatened and endangered species at present, as well as habitat areas potentially lost or gained upon completion of the project. The project should be analyzed again, using updated FLUCCS codes, once available to more accurately classify land areas.

Wood stork

Harm: Structures for this feature lie within the CFA of four known wood stork colonies (Fig. 48-4). FLUCCS codes classify the effected areas as 292 acres of freshwater marsh for improved L-33 and L-37, and 273 acres of freshwater marsh for improved L-30. These areas may provide suitable foraging habitat to wood storks. The total area of impact from canal improvements is

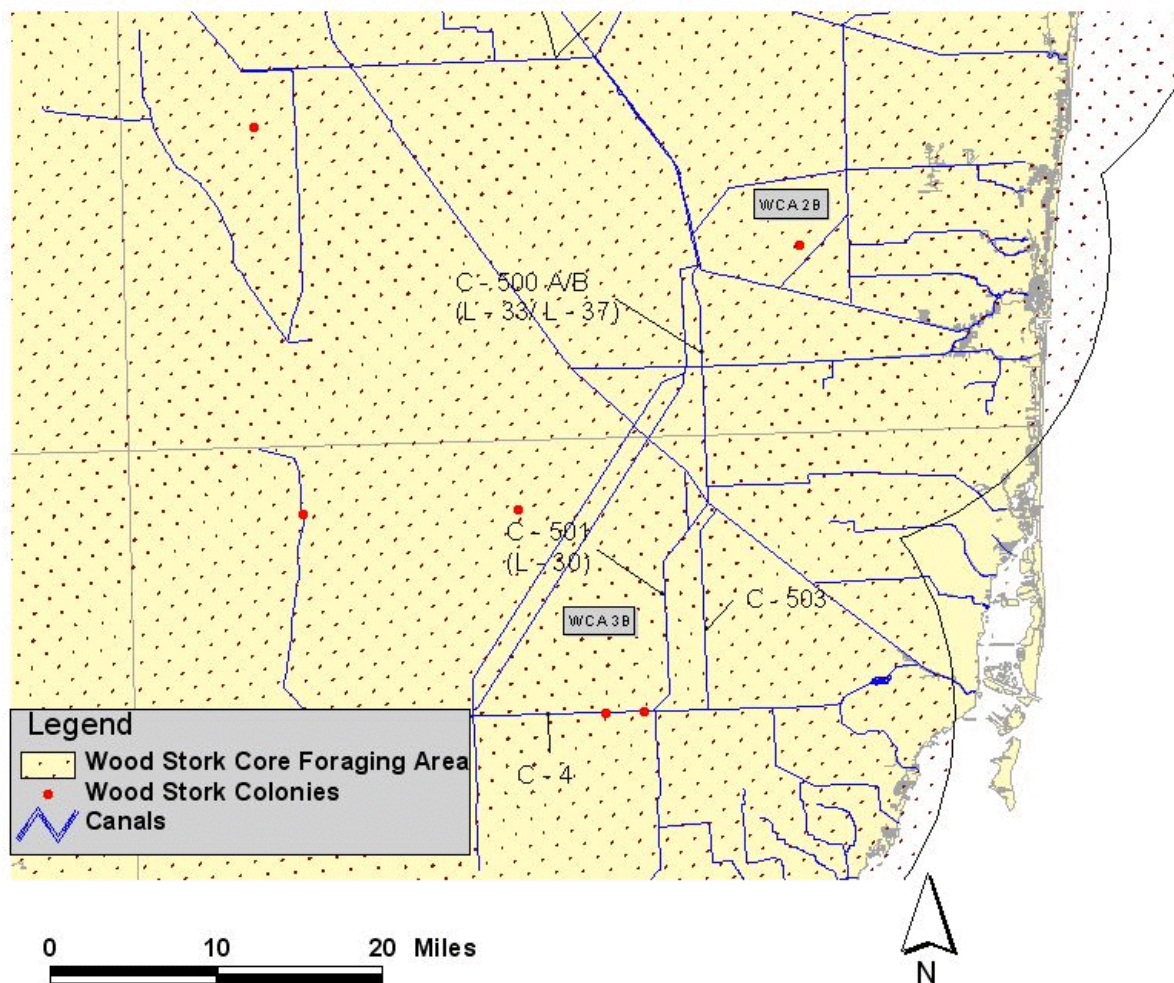


Figure 48-4. Threatened and endangered species associated with Water Conservation Area 2B Flows to Everglades National Park project.

565 acres. The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning.

Everglade snail kite

Harass/Harm: Nesting data (1998-2000) demonstrate nesting activity in very close proximity (approximately 1000 feet) to L-30. Improvements to the L-30 canal may harm or harass nesting snail kites if construction occurs during breeding season. Furthermore, construction may remove

small trees on the canal edge which are preferred nesting substrates. The area effected by improvements to L-30 is estimated at 273 acres.

Eastern indigo snake

The indigo snake is a likely inhabitant of the project area, due to the presence of potentially suitable habitat. Indigo snakes may be harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* will be implemented during project construction and included in the environmental protection plan when the Corps proceeds to the plans and specifications phase for the project.

Harm: 170, 122 and 273 acres of freshwater marsh will be effected due to improvements of L-33 and L-37 and L-30 respectively. Pump station construction will effect 2.5 acres. The total area of effect is approximately 568 acres.

West Indian manatee

Manatees are known to reach and be killed or injured at inland water control structures, and the Service and Corps are part of a multi-agency effort to eliminate this threat. Manatee are known to infrequently use the L-37, L-33, and L-30 canal system. Consideration should be given to excluding manatee access to these canals from Lake Okeechobee. Further guidance for structure design and manatee conservation is being developed by a multi-agency team. Construction activities within canals used by manatees may disturb or injure manatees. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented in areas accessible to manatees.

Coordination with the Corps and the District for the WCA 2B Flows to ENP project

September 5, 2002. WPA PDT meeting announcing separation of project into 9 distinct projects/PIRs.

October 2, 2002. Site visit with the District.

November 9, 2002. Project overview meeting with the District.

February 24, 28, 2003. Sent e-mail to Corps requesting project description verification.

March 3, 2003. Sent e-mail to Corps pertaining to project description.

February 28 and March 14, 2003. Sent e-mail to the District pertaining to project description.

Section 7 consultation history

On September 23, 2000, the Corps initiated informal section 7 consultation by letter for the original WPA project configuration, which included WCA 2B Flows to ENP. The consultation was based on the WPA Feasibility Study and includes all WPA project components in Palm Beach, Broward, and Miami-Dade Counties, encompassing a

significantly larger project description and included effects analysis for threatened and endangered species for all components.

On October 24, 2000, the Service provided a letter to the Corps including a list of species which could be affected by the project. In that correspondence, the Service recommended that the Corps continue informal consultation throughout the preliminary planning process as design iterations were evaluated.

On March 21, 2001, following selection of the plan, the Corps forwarded a Biological Assessment by letter. The Biological Assessment considered potential effects on the following species: West Indian manatee, snail kite, wood stork, Cape Sable seaside sparrow, and eastern indigo snake. The Corps determined that the WPA project is not likely to adversely affect any of the considered species or adversely modify critical habitat.

On April 18, 2001, the Service concurred by letter with the Corps' determination. This concurrence covered the physical layout of the selected plan and considered the range of operations as modeled in the PSP and PSPS 1234 regional water model simulations. The Service recommended reinitiation of consultation on the snail kite, wood stork, and Cape Sable seaside sparrow once a more detailed operational plan is proposed for the WPA project.

Recommendations for WCA 2B to ENP

The Service recommends that less damaging alternatives for disposal of materials from canal excavation be explored. We recognize that side casting was chosen as the least expensive alternative. However, in light of the proposed loss of 565 acres of freshwater marsh under this alternative and the recognition that reducing or reversing the loss of spatial extent of Everglades wetlands is a fundamental CERP goal, the Service believes that alternative exploration is prudent. Beneficial uses of this material (*e.g.*, berm construction for property protection nearby) may reduce net costs of trucking offsite.

WPA Conveyance project description

Dade-Broward Levee and Canal and North Lake Belt Storage Area Turnpike Deliveries

As described in the Restudy and the Draft WPA Feasibility Report, the Dade Broward Levee and Canal Project is comprised of several components of the CERP including the Dade Broward Levee/Pennsuco Wetlands (BB) and North Lake Belt Storage Area partial Turnpike Deliveries (XXP1) (Fig. 49-1).

The Dade-Broward Levee and Canal design region is located primarily between the C-6 canal (Miami Canal) and the C-4 canal along U.S. 41. The C-501 canal location is the same as the existing L-30 borrow canal and runs parallel between the L-30 levee and Krome Avenue bordering WCA 3B and the Pennsuco Wetlands, respectively. The C-503 canal is located roughly on the same alignment as the existing maintained and non-maintained reaches of the Dade-Broward Levee Canal, with the exception of the northern most reach.

The purpose of this component is to reduce seepage to the east from the Pennsuco wetlands and southern WCA 3B, enhance hydroperiods in the Pennsuco Wetlands, provide recharge to the Miami-Dade Northwest Well field and convey regional water supply deliveries south to Miami-Dade County. This component includes water control structures, canal conveyance improvements and modifications to the Dade-Broward Levee region located in Miami-Dade County (Figs. 49-2a-2c). The existing Dade-Broward Levee Canal will not be impacted. A new conveyance canal will be constructed east of this existing canal, to convey regional water supply deliveries south from Lake Okeechobee to the C-6, C-7, C-4 and C-2 canals and the South Dade Conveyance System. This new canal is used instead of the Florida Turnpike canal as designed in the Restudy. A water control structure in the new canal is proposed on the northern levee of the intersection with the C-4 canal which will maintain a control elevation of 5.1 feet NGVD. The new canal will impact approximately 3.3 miles of the old Dade-Broward Levee Canal south of the Florida Power and Light access.

The L-503 levee consists of a west bank (the existing Dade-Broward Levee) and a proposed east bank spoil mound. The L-503 west bank levee's primary purpose is to contain elevated stages within the Pennsuco Wetlands, thereby improving rain driven hydroperiods. The L-503 east bank spoil mound's primary purpose is to contain higher stages within the new conveyance canal when stages are elevated to reduce seepage from the Pennsuco Wetlands and WCA 3B. The new conveyance canal (Figs. 49-2a-2b) includes remnants of the non-maintained reach of the Dade-Broward Levee Canal. The canal conveyance capacity is 1,400 cfs with 2 control structures, a gated spillway (S-516) at the upstream end and gated culverts (S-519A) at the downstream end. The canal reach starts at the C-6 canal (Miami Canal) at S-516 between the C-501 canal and the proximity junction of Miami Canal with U.S. 27. The canal runs parallel to the C-501 canal until it nears the maintained reach of the Dade-Broward Levee Canal; it then turns south and runs parallel to the Dade-Broward Levee and Canal. The canal continues until it reaches south of an

Florida Power and Light access maintenance road at a bridge crossing (S-518) where it replaces the remaining reach of the Dade-Broward Levee Canal to S-519A (Figs. 49-2b-2c).

The new conveyance canal stages north of S-519A will be controlled at 5.10 feet NGVD when deliveries are not being made. The water source to maintain stages will be mostly comprised of seepage loss from Pennsuco Wetlands and WCA 3B with supplemental water delivery from Lake Okeechobee. Backwater calculations for deliveries showed canal elevations ranging from 4.50 feet NGVD at the headwater of S-519A (downstream) to 5.40 feet NGVD at the tail water of S-516 (upstream).

Spoil material from canal excavation will be side cast, shaped and maintained on lands adjacent to the canal. A 30-foot setback from the canal edge is implemented for operating excavation and mound shaping equipment. The proposed footprint impact will be a total of 472 acres of Brazilian pepper (156 canal excavation, 73 levee construction and 243 side casting).

Project access to structures will be accomplished using existing roads and levees as designated in the Draft WPA Feasibility Report, Appendix B.9.4. The feasibility level design phase demonstrated that a material balance can be achieved on-site and that off-site disposal sites are not needed.

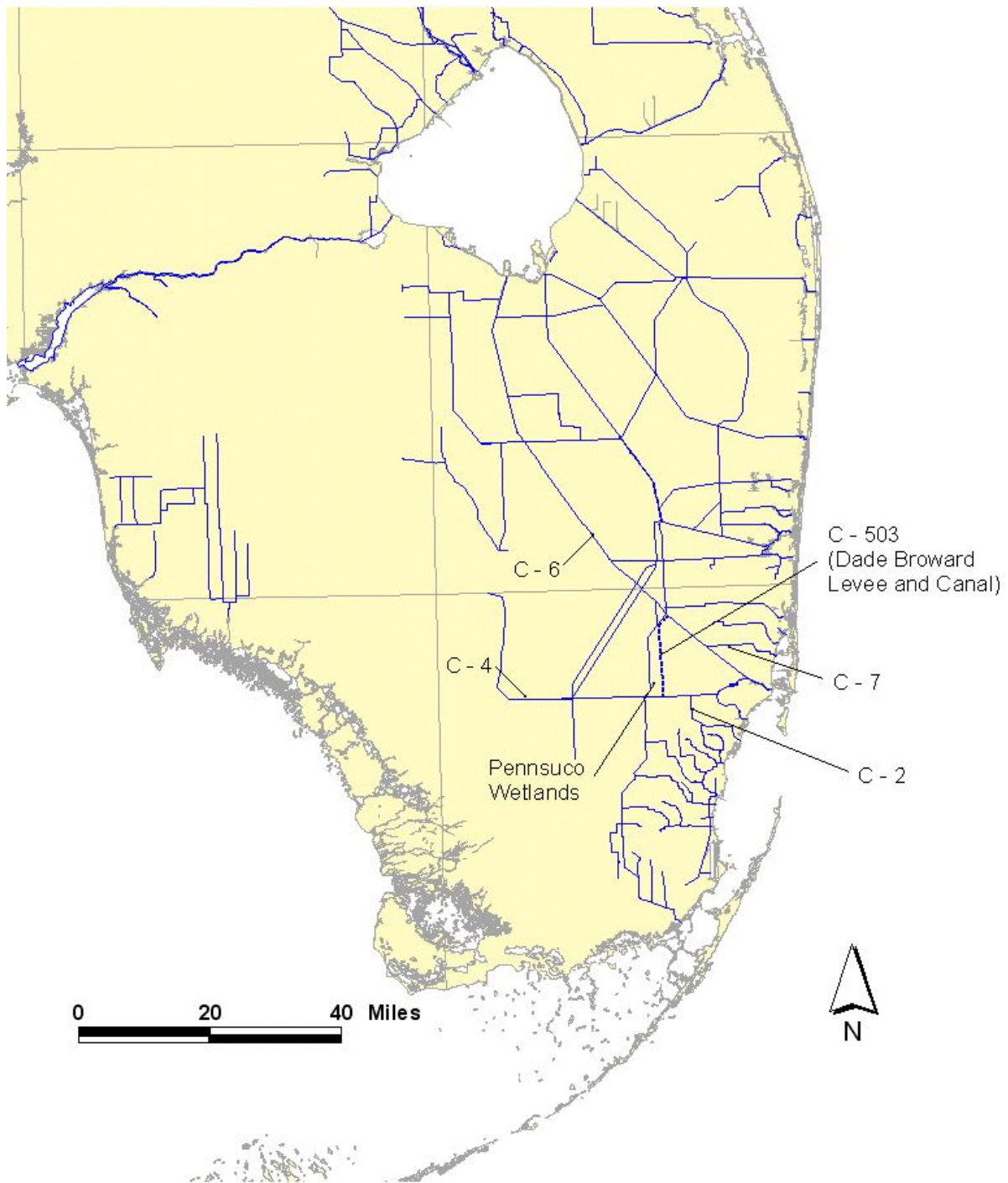


Figure 49-1. Location of Dade-Broward Levee and Canal (Water Preserve Area Conveyance).

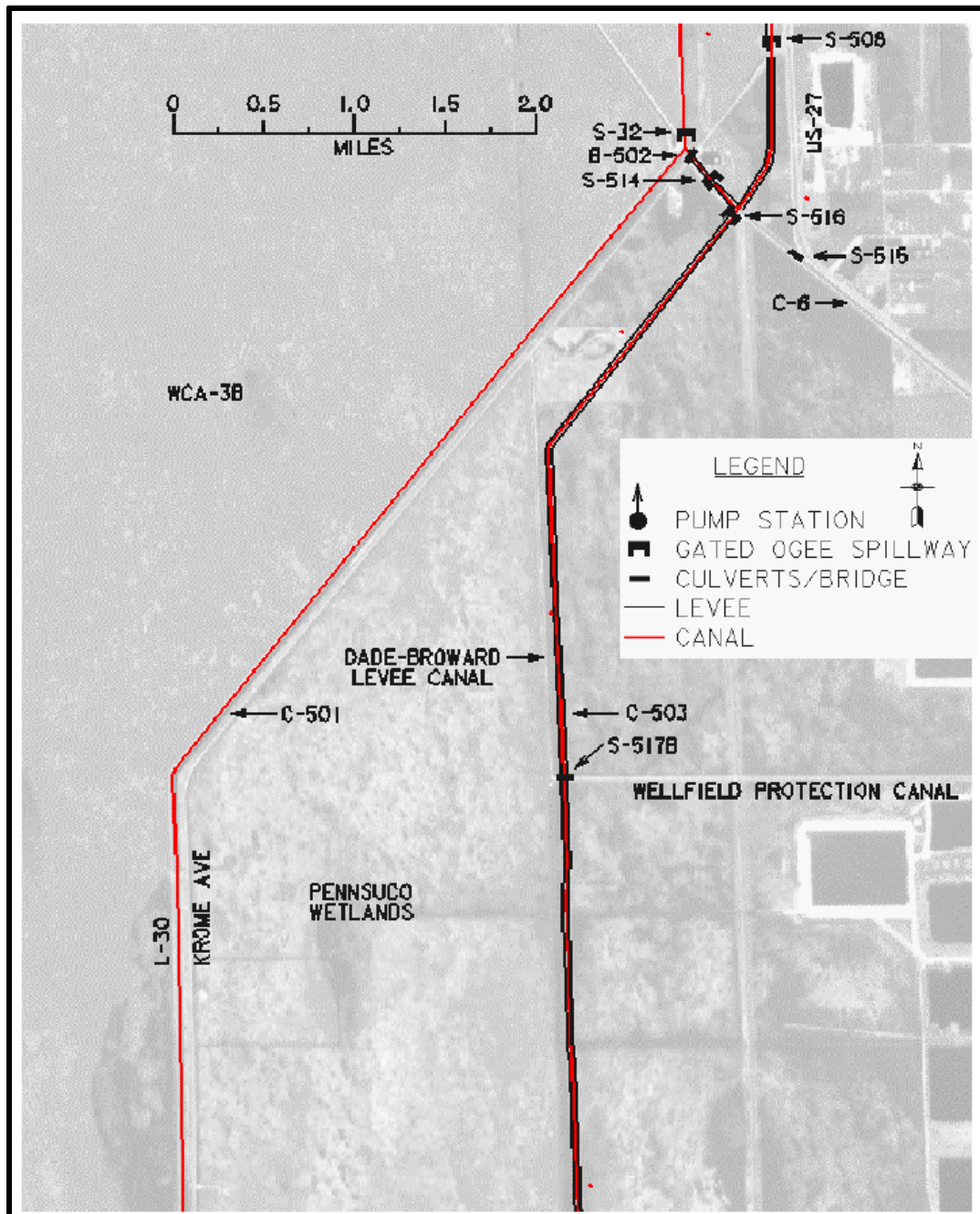


Figure 49-2a. Dade-Broward Levee and Canal project features (Figure 8.1-7, Corps 2001).

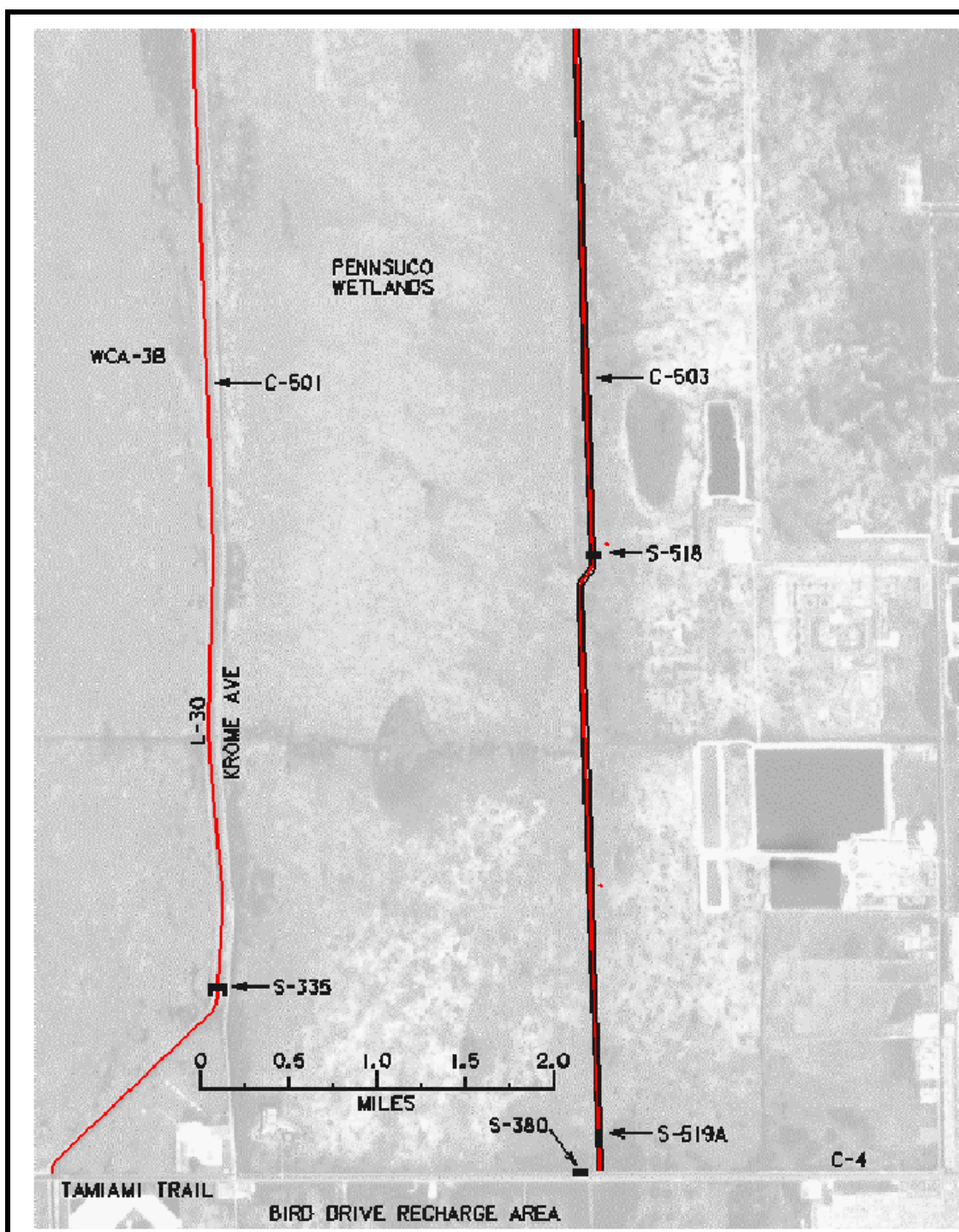


Figure 49-2b. Dade-Broward Levee and Canal project features (Figure 8.1-8, Corps 2001).

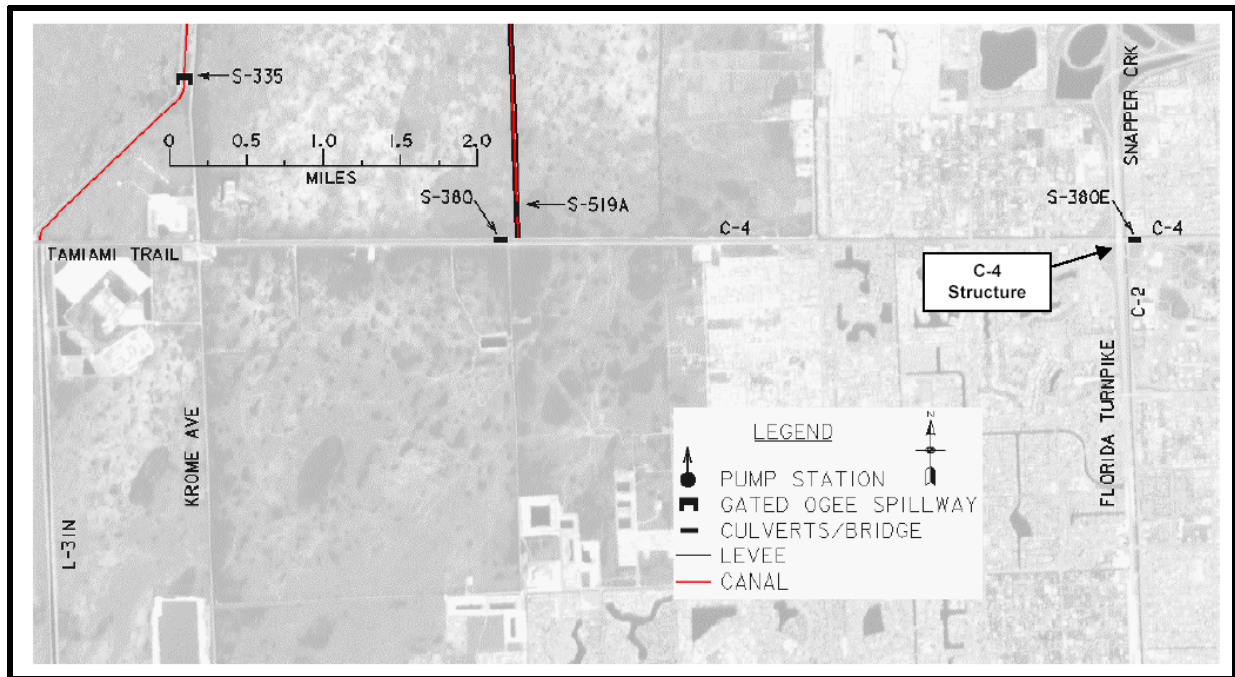


Figure 49-2c. Dade-Broward Levee and Canal project features (Figure 8.1-9, Corps 2001).

Initial effects analysis for the WPA Conveyance

There are no fish and wildlife design features for the new conveyance canal. The Draft WPA Feasibility Study states that this canal will provide additional fish and wildlife habitat in a non-public accessible area and that the reach, where the new canal and the Dade-Broward Levee Canal are parallel, should be a very desirable habitat area for many indigenous species. The Service believes that further design features for wildlife habitat, such as littoral shelves, would be necessary to create habitat attractive to multiple wildlife species.

FLUCCS codes (1995) were used to estimate habitat potentially used by threatened and endangered species at present, as well as habitat areas potentially lost or gained upon completion of the project. The project should be analyzed again, using updated FLUCCS codes to more accurately classify land areas.

Wood stork

Wood stork colonies and CFAs associated with the WPA Conveyance features are shown in Figure 49-3. Structures for this feature lie within the CFA of four known wood stork colonies. FLUCCS codes classify the impacted areas as Brazilian pepper, which is not considered wood stork habitat. Canal and water depths will determine the extent to which wood storks can effectively forage. The Service suggests designing canal improvements to provide suitable foraging habitat for wood storks on canal edges, when possible. The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning.

Eastern indigo snake

The indigo snake is a likely inhabitant of the project area, due to potentially suitable habitat. Indigo snakes may be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* will be implemented during project construction and included in the environmental protection plan when the Corps proceeds to the plans and specifications phase for the project.

Harm: 472 acres of Brazilian pepper will be effected due to construction of the new conveyance canal and levee; however, 316 acres of potential habitat will be reinstated by the new levee (73 acres) and the side casting mound (243 acres). The resulting net loss of indigo snake habitat will be approximately 156 acres.

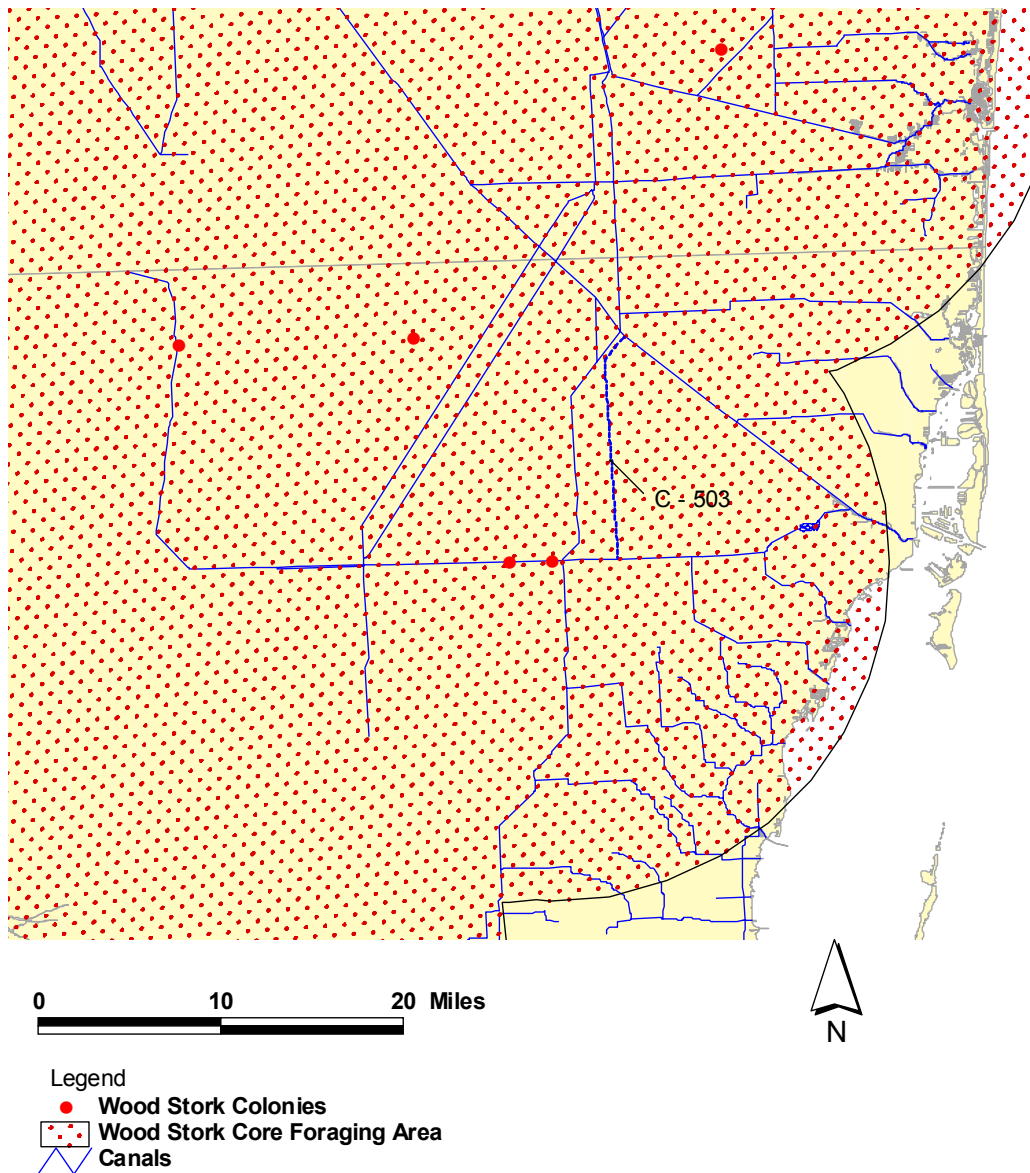


Figure 49-3. Threatened and endangered species, and structures associated with the Water Preserve Area Conveyance project.

West Indian manatee

Manatees are known to reach and be killed or injured at inland water control structures. Manatees have been sited in the C-6 and C-2 extension and could access the Dade-Broward Levee Canal. A manatee barrier was installed in the summer 2003 at the eastern confluence of C-4 and the Dade-Broward Levee Canal. This should preclude manatee entering the project from C-4. Three new culvert structures are planned for installation in the Dade-Broward Levee

Canal; a two-barreled, gated culvert (S-517B), a single-barreled, ungated culvert (S-518), and a three-barreled, gated culvert (S-519A). If appropriate, these culverts should be fitted with grates to exclude manatee. In the Draft WPA Feasibility Study, the Manatee Protection Plan suggested a barrier east of the new structure S-519B in C-4 canal. The Service recommends a regional approach to manatee protection considering the multiple canal accesses in this county. Further guidance for structure design and manatee conservation is being developed by a multi-agency team. Construction activities within canals used by manatees may disturb or injure manatees. The Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented in areas accessible to manatees.

Coordination with the Corps and the District for the WPA Conveyance project

September 5, 2002. WPA PDT meeting announcing separation of project into 9 distinct projects/PIRs.

October 2, 2002. Site visit with the District.

November 9, 2002. Project overview meeting with the District.

February 26 and 28, March 24, 2003. Sent e-mail to Corps requesting project description verification.

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Section 7 consultation history

On September 23, 2000, the Corps initiated informal section 7 consultation by letter for the original WPA project configuration, which included WPA Conveyance. The consultation was based the WPA Feasibility Study and includes all WPA project components in Palm Beach, Broward, and Miami-Dade Counties, encompassing a significantly larger project description and included effects analysis for threatened and endangered species for all components.

On October 24, 2000, the Service provided a letter to the Corps including a list of species which could be affected by the project. In that correspondence, the Service recommended that the Corps continue informal consultation throughout the preliminary planning process as design iterations were evaluated.

On March 21, 2001, following selection of the plan, the Corps forwarded a Biological Assessment by letter. The Biological Assessment considered potential effects on the following species: West Indian manatee, snail kite, wood stork, Cape Sable seaside

sparrow, and eastern indigo snake. The Corps determined that the WPA project is not likely to adversely affect any of the considered species or adversely modify critical habitat.

On April 18, 2001, the Service concurred by letter with the Corps' determination. This concurrence covered the physical layout of the selected plan and considered the range of operations as modeled in the PSP and PSPS 1234 regional water model simulations. The Service recommended reinitiation of consultation on the snail kite, wood stork, and Cape Sable seaside sparrow once a more detailed operational plan is proposed for the WPA project.

Miccosukee Water Management Plan project description

The Miccosukee Water Management Plan is a project to construct a managed wetland on the Miccosukee Tribe reservation lands located in western Broward County (Fig. 90-1). The project as described in the Restudy will convert approximately 900 acres of tribally-owned cattle pastures into a wetland retention /detention area to provide water storage capacity and water quality enhancement for waters which discharge into the Everglades Protection Area. No additional information on this inactive project is available at this time. Therefore, we have made several reasonable assumptions about project details. Based on planning for other, similar C&SF Restudy features, we have assumed that retention/detention area construction will include leveling and/or scraping of the entire 900 acres. Based on the stated water quality enhancement purpose, we have assumed that retention/detention area operations will be designed to maintain emergent wetland vegetation, similar to an STA. The project includes a pump station, levees, trenches and culverts to create the inflow and outflow facilities for the retention/detention area. Information on the location and sizes of these features is not available. For the purposes of this analysis we have made reasonable estimates as follows. Levees will be counted as approximately 30 acres (based on a 50-foot width around the 900-acre detention pond), the pump station as 5 acres and trenches and culverts as 2 acres. We have assumed that these features will be located in pasture, the major cover type in the immediate project area. Tribal Water Quality Standards dictate a numerical criterion of 10 parts per billion for total phosphorous inside the Everglades Protection Area. The Miccosukee Water Management Plan was sized to treat the nutrient inputs of the Miccosukee Tribal lands (Fig. 90-2).

The Miccosukee Tribe of Florida owns 78,600 acres and holds another 189,000 acres in perpetual lease in Miami-Dade, Broward, and Hendry counties. Reservation lands are managed for improved pasture (irrigated), wildlife habitat, and some citrus production. The majority of the Miccosukee Reservation is open sawgrass marsh. The mostly undeveloped Reservation provides habitat for many wildlife species (Service 1999a).

Initial effects analyses for the Miccosukee Water Management Plan project

Ecological Community Types In Project Area

The ecological community in the immediate project area is classified as prairie grasslands where natural vegetation has been largely replaced by improved pastures. Dominant vegetation includes pasture grasses such as bahia and scattered shrubs such as wax myrtle and the noxious weed species Brazilian pepper. Cypress ponds are scattered throughout pastures, often with dense Brazilian pepper and wax myrtle around the edges of the ponds. The ecological community type surrounding the proposed project area is dominated by sawgrass, pickerelweed, cattails, and willow. Soils are level and very poorly drained with organic surfaces over limestone or marl (The Seminole Agency 1999).

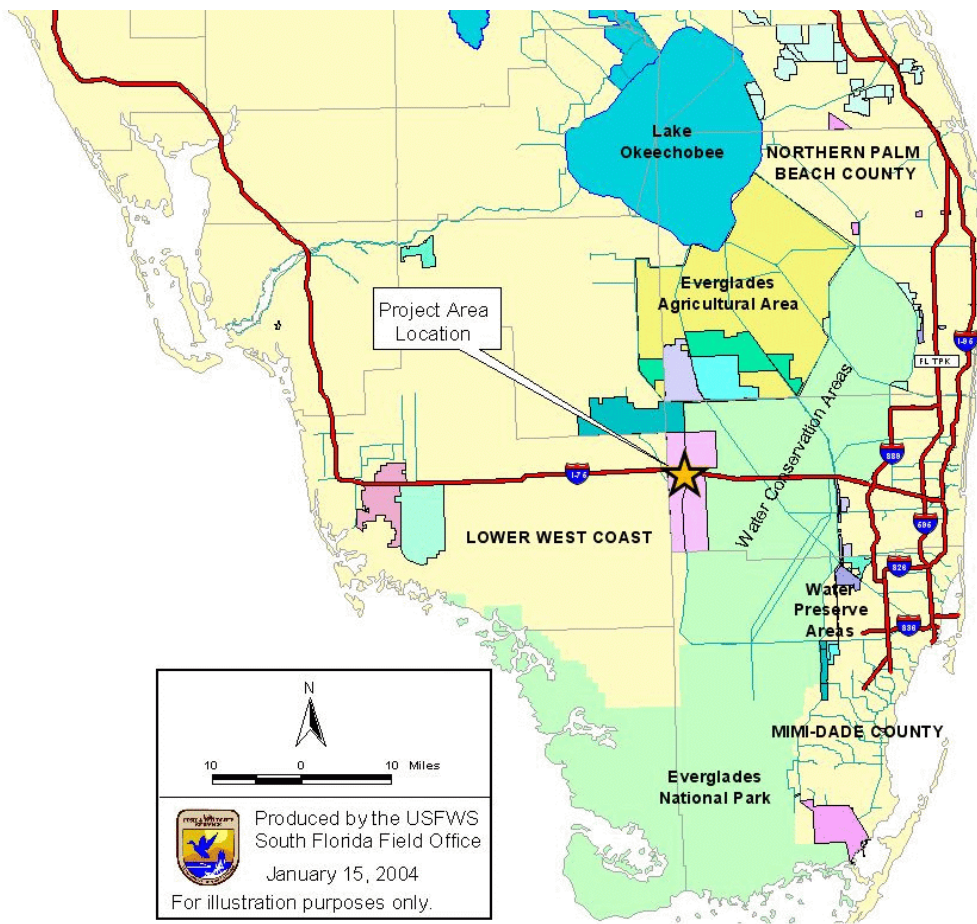


Figure 90-1. Miccosukee Water Management Plan - South Florida project location.

FLUCCS codes identified in the immediate project area include wet prairie (643), mixed wetland hardwood (617), and improved pasture (211). In addition, the following FLUCCS codes were identified in the area surrounding the proposed project site: freshwater marsh (641), cypress with wet prairie (6219), freshwater marsh - cattail (6412), freshwater marsh - sawgrass (6411), cypress (621), and improved pasture (211).

The proposed project has the potential to adversely affect five federally-listed species. Federally listed species that are known to occur in the vicinity of, may occur in, or may be affected by the Miccosukee Water Management Plan are the threatened eastern indigo snake, threatened bald eagle, endangered wood stork, endangered everglade snail kite, and the endangered Florida panther.

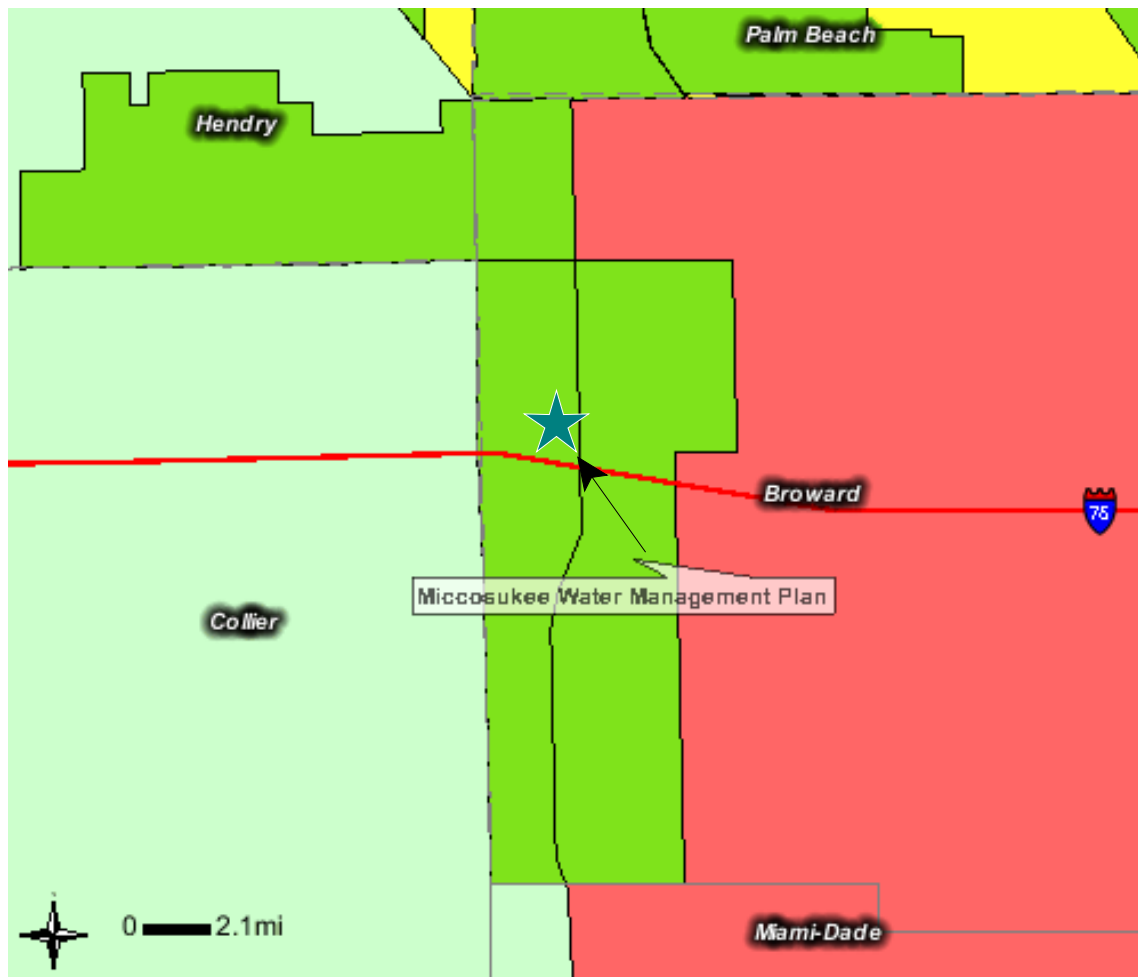


Figure 90-2. Miccosukee Water Management Plan - project location on Miccosukee Indian Reservation (<http://www.evergladesplan.org/pm/projects/cerp_gis.cfm>).

Eastern indigo snake

There is potential for eastern indigo snakes to inhabit the project area.

Harm: Approximately 900 acres of improved pasture/wet prairie will be converted to short and/or long-hydroperiod wetlands with no interspersed uplands within the water detention/retention pond. Approximately 7 acres of improved pasture will be converted to a pump station, trenches and culverts that would not provide suitable habitat for indigo snakes. Construction disturbance of indigo snakes is likely to occur within the entire 937-acre project footprint. The Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

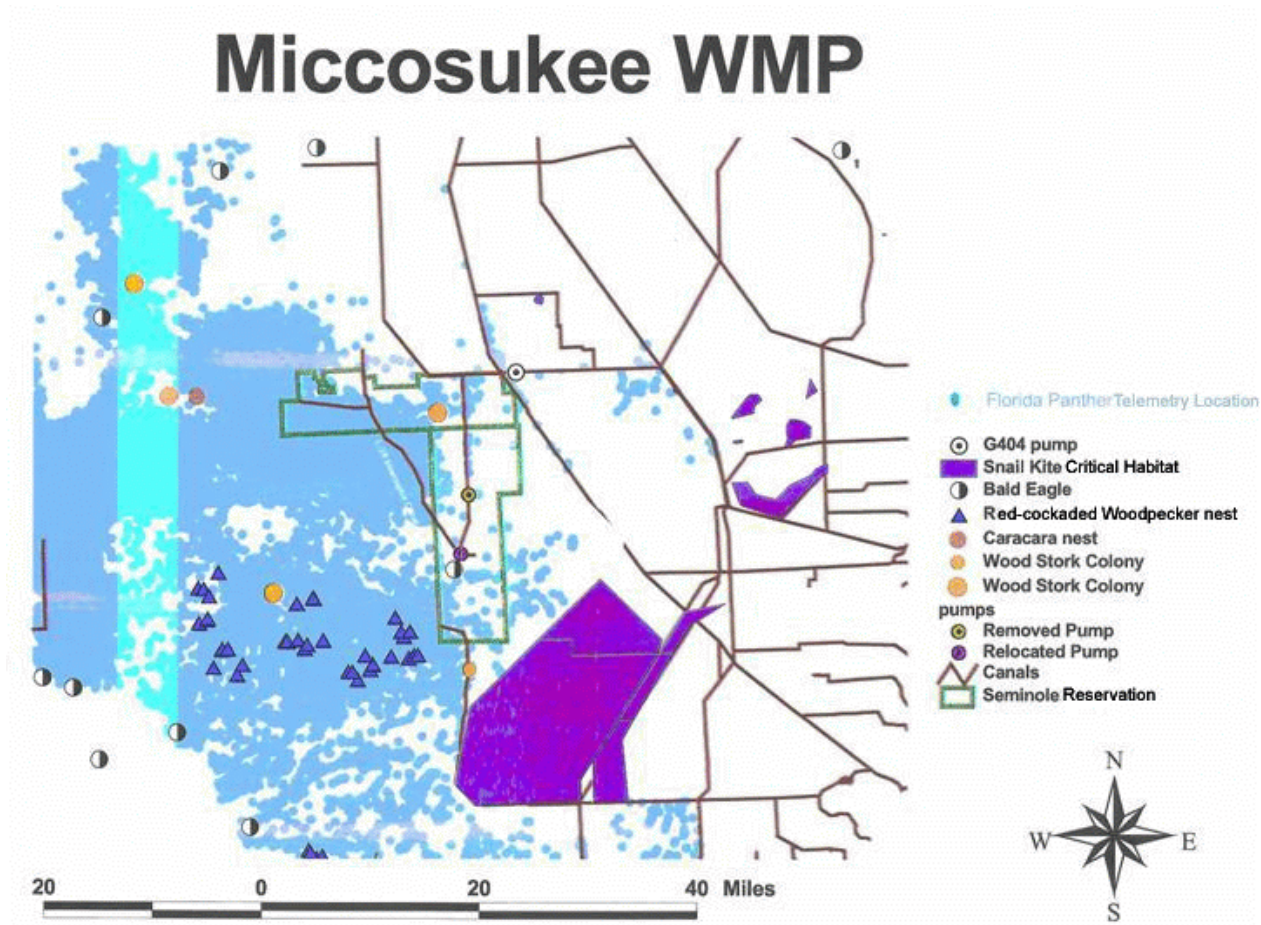


Figure 90-3. Miccosukee Water Management Plan project area wildlife habitat locations, Florida panther radio telemetry locations, and snail kite nesting locations.

Benefit: Approximately 30 acres of improved pasture will be converted to levees. This area should provide suitable indigo snake habitat both before and after construction.

Wood stork

Wood stork rookeries have been identified around the proposed project location and the proposed project footprint is within a CFA (Fig. 90-3).

Harm: Approximately 900 acres of improved pasture/wet prairie within the water detention/retention pond footprint will be converted to short and/or long-hydroperiod wetlands depending on the operation of the ponds. As with STAs, we have assumed that wood storks may use the retention/detention area on occasion, but the area is unlikely to provide reliable habitat and will not be counted as new foraging habitat. Approximately 37 acres of improved pasture

will be converted to a pump station, levees, trenches and culverts. The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* should be consulted during project planning.

Benefit: Future project planning could include features to increase the wildlife value of the retention/detention area. In general, the creation of irregular shorelines, islands in open water areas, and functioning littoral wetlands should promote biological diversity and species abundance within portions of the water detention pond and, secondarily, provide improvements to water quality. Varied ground elevations will provide both long-and short-legged wading birds favorable foraging conditions. Favorable foraging conditions should be maximized during wood stork nesting season (January through mid-August).

Everglade snail kite

Critical habitat for the snail kite is located immediately southeast of the project area in WCA 3A (Fig. 12). However, the immediate project area does not include any suitable snail kite habitat.

Benefit: Approximately 3.6 acres of suitable foraging habitat will be created along the edges of the detention/retention pond.

Bald eagle

There is a known bald eagle nest approximately 5 to 8 miles south of the project area (Fig. 90-3). Based on our current, but highly uncertain information on project location, no harm to bald eagles is expected. In the event that the project location shifts closer to a bald eagle nest site, construction may cause harassment of nesting eagles.

The project includes a new pump station placed near the detention/retention area. Associated new power lines may pose an electrocution hazard to eagles and the publication *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* should be consulted for recommended measures to protect eagles from electrocution.

Florida panther

Radio-collared panthers have been located in the immediate area of the proposed project (Fig. 90-3). Approximately 937 acres of the project footprint are located in high to medium value habitat for the Florida panther within the Primary/Dispersal Zone. The pasture habitat that we have assumed will be converted to the retention/detention area and associated infrastructure is of medium value.

Harm: Approximately 37 acres will be used as a pump station, trenches, culverts, and levees providing no habitat value for the Florida panther. Approximately 900 acres will be converted to the retention/detention area.

Coordination with the Corps and the District for the Miccosukee Water Management Plan project

The Corps was sent an email request for information and current project activity/status. The project manager responded as follows: “The only information that we have on this plan is in the C&SF Restudy. We do not have a Design Agreement and therefore nothing has happened and will not happen until the design agreement is finalized and a PDT formed to do the evaluation.”

Section 7 consultation

No consultation has occurred on this inactive project.

Winsberg Farm Wetlands Restoration project description

The Winsberg Farm Wetlands Restoration Project located in Palm Beach County (Fig. 91-1) will involve the construction of approximately 140 acres of long hydroperiod wetland, with Palm Beach County acting as the local sponsor. The project consists of creating a series of wetland impoundments ranging from 1 foot deep in shallow marsh zones to 6 feet deep in deep-water zones on land that is currently occupied by row cropland. The source of water will be secondarily treated effluent from the Palm Beach County Southern Region Water Reclamation Facility. In addition to wetlands, the project will involve approximately 35 acres of access roads, parking lots, an interpretive facility, and earthen berms. The project goals are to: (1) provide indirect aquifer recharge with water that otherwise would be disposed of in deep injection wells, and (2) provide wetland habitat.

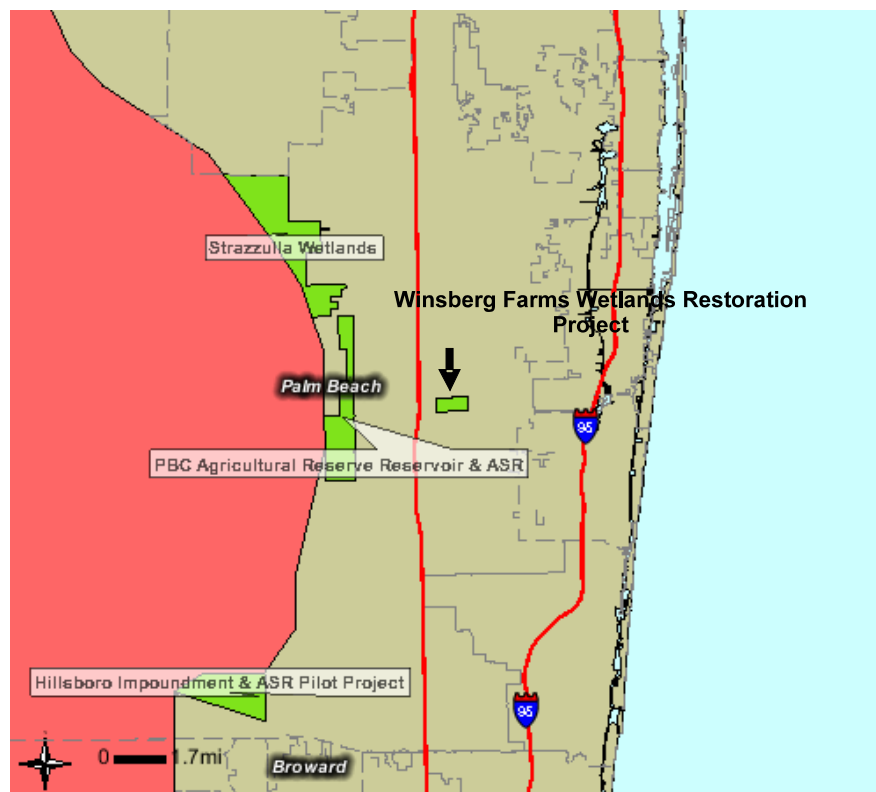


Figure 91-1. Location of Winsberg Farms Wetland Restoration Project (http://www.evergladesplan.org/pm/projects/cerp_gis.cfm).

Initial effects analysis for the Winsberg Farm Wetlands Restoration

Federally listed species that may be effected by the Winsberg Farm Wetlands Restoration Project include the Everglade snail kite, wood stork, bald eagle, and Eastern indigo snake. There is currently no documented use of the project area by these species, but wood storks and bald eagles have been observed at the Wakodahatchee Wetlands located less than 1 mile away, and snail kites have been documented in the Loxahatchee Refuge located approximately 4 miles away. Dispersal by each of these birds in order to forage in a long hydroperiod emergent marsh created on the Winsberg property is possible. Indigo snakes are known to occur on agricultural lands, and it is assumed that they are found on the Winsberg Farms property.

Harmful and beneficial effects to species are estimated here in terms of acres of potential habitat effected. The acres are based on estimates of land use in the project footprint as discussed at the January 2003 PDT meeting, and are as follows:

- a. 175 acres total
- b. 25 acres parking lots and infrastructure
- c. 140 acres wetland
- d. 10 acres earthen berms surrounding wetland

Everglades snail kite

Benefit: 140 acres of row cropland converted to long hydroperiod emergent marsh interspersed with deep-water zones.

Wood stork

Harm: The project area is located within the CFA for known wood stork nesting colonies in the Loxahatchee Refuge. Construction disturbance to individuals foraging in the Lake Worth Drainage District canal bordering the Winsberg property is possible. Potential foraging habitat in irrigation ditches within the row cropland (accounting for less than 10 acres) will be lost.

Benefit: 140 acres of row cropland converted to long hydroperiod emergent marsh with interspersed deep-water zones.

The Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region* and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks in the South Florida Ecological Services Consultation Area* should be consulted during project planning.

Bald eagle

Benefit: 140 acres of row cropland converted to long hydroperiod emergent marsh with interspersed deep-water zones.

Eastern indigo snake

Harm: 165 acres of row cropland converted to long hydroperiod emergent marsh and parking lot/infrastructure. Indigo snakes may be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Benefit: 10 acres of row cropland converted to upland berm adjacent to long hydroperiod marsh

Effects to species outside of the project footprint will be related to the amount of water that the project returns to the system via aquifer recharge or surface discharge to canals. This amount of water has not been quantified at this time, nor has any link been established between aquifer recharge or surface discharge rates and species effects; therefore, no estimates of offsite benefit or harm to species have been made in this document.

It is highly likely that this project will be divided into two phases of approximately equal size. Palm Beach County will be responsible for completing Phase I. Phase II will be planned and implemented with the Corps acting as the federal sponsor. The wetland habitat acres for Phase II will be approximately 70 acres. This phased approach has not yet been finalized and, as such, the information provided in the previous sections reflects 140 total wetland acres.

Interagency Coordination for Winsberg Farm Wetlands Restoration

Estimates of land use in the project footprint as discussed at the January 2003 PDT meeting.

Consultation History for Winsberg Farm Wetlands Restoration

Informal consultation is ongoing for this project. At the Corps' request, the Service transmitted a species list on March 12, 2002.

Restoration of Pineland and Hardwood Hammocks in the C-111 Basin project description

Restoration of Pineland and Hardwood Hammocks in the C-111 Basin would be located in south Miami-Dade County, just east of ENP, along S.R. 9336 in the area known as the Frog Pond. Eighty percent of the Frog Pond was used for agricultural purposes, and farmers rock plowed the cap rock to create soil for tomato farming. The Frog Pond has since been purchased by the District as part of the C-111 Project to restore the Taylor Slough portion of the Everglades. The project involves restoring south Florida slash pine and tropical hardwood hammock species on a 200-foot wide strip on each side of the 2 miles of S.R. 9336 from the C-111 canal to the L-31W canal (approximately 50 acres) (Fig. 92-1). Two 1-acre hammock sites would be established in low-lying areas on each side of the road. Native species initially proposed for the site include dahoon holly, gumbo limbo, live oak, sweet bay, and paradise tree, as well as a variety of shrub plants. Once the overstory has become established, the project would add additional shade species to provide an understory within the hammocks. Monitoring efforts would be included in the project design in order to demonstrate the progressive reduction in vulnerability to encroachment of exotics as the native plants mature. This project would demonstrate the techniques required to re-establish native conifer and tropical hardwood forests on land that has been rock plowed.

Tropical hardwood hammocks are defined as evergreen, broad-leaved forests composed of shrub and tree species that are common to the Bahamas and Greater Antilles. Along with rockland pine forests, these vegetative communities form the rockland ecosystems of south Florida. Rockland tropical hammocks occupy elevated, rarely inundated, and relatively fire-free areas in three major rockland areas of south Florida: the Miami rock ridge, the eastern Big Cypress Swamp, and the Florida Keys. Rockland plant ecosystems can be considered as just one component of the diverse mosaic of plant communities that contribute to habitat heterogeneity and ultimately to the biological diversity of south Florida's natural environment.

Tropical hammocks that comprise the rockland plant ecosystems support a large number (59 taxa) of rare and threatened plants and therefore represent important habitat for consideration in restoration efforts. This project is important if only for the valuable monitoring information it will provide relative to re-establishment of native species on rock-plowed lands. Other locations within the Everglades ecosystem that have been disturbed by past land use practices may also provide an opportunity to implement similar revegetation efforts and thus provide important habitat for sensitive plant and wildlife species.

At the present time, this project is not funded and has not proceeded beyond the initial recommendation.



Figure 92-1. Aerial photograph of the project area.

Project footprint

Current land use maps show that 100 percent of the project area is in agriculture. The project would be located along S.R. 9336 between the C-111 and L-31W canals. At this time it is envisioned that several small patches (1 acre or less) of tropical hardwood hammock would be restored on the 50-acre site.

Threatened and Endangered Species and Designated Critical Habitats

Florida panther

Florida panthers have been found in almost all southern Florida communities, including mesic temperate hammocks. Telemetry studies have shown that some panthers traverse through the shrub-dominated freshwater marsh vegetation and the fringe agriculture and urban zones located just south (< 6500 feet) of the project area. Primary prey for the Florida panther, white-tailed deer and feral pigs, are abundant in mesic hammocks. Panther habitat has been severely

decreased by increased urbanization and agricultural expansion into its habitats; however, panthers may persist where forested areas, such as mesic hammocks, exist in a mosaic of agricultural lands. A mix of forested and cleared lands seems to benefit white-tailed deer and feral hogs, the main components of Florida panther diet. This project will create about 50 acres of high-quality pine and hardwood hammock panther habitat within the Primary/Dispersal Zone.

The proposed project may serve as an attractive nuisance for panthers that may be drawn to the hammocks in search of prey but may wander into nearby roadways. Fences have been constructed along S.R. 9336, in the vicinity of the project, which separates the Frog Pond from the road.

Eastern indigo snake

Eastern indigo snakes utilize a wide variety of habitat types in southern Florida including tropical hardwood hammocks, pine rocklands, freshwater marshes, abandoned agricultural land, coastal prairie, mangrove swamps, and human altered habitats. Construction of the proposed project would enhance 50 acres of current indigo snake habitat through creation of pine and tropical hardwood hammocks. However, indigo snakes may be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Coordination with Corps and The District

There has been no inter-agency coordination or section 7 consultation on this project to date.

Henderson Creek/Belle Meade Restoration project description

Detailed planning for the Henderson Creek/ Belle Meade Restoration project (Fig 93-1) has not yet begun. All of the information provided below is preliminary and based on discussion among

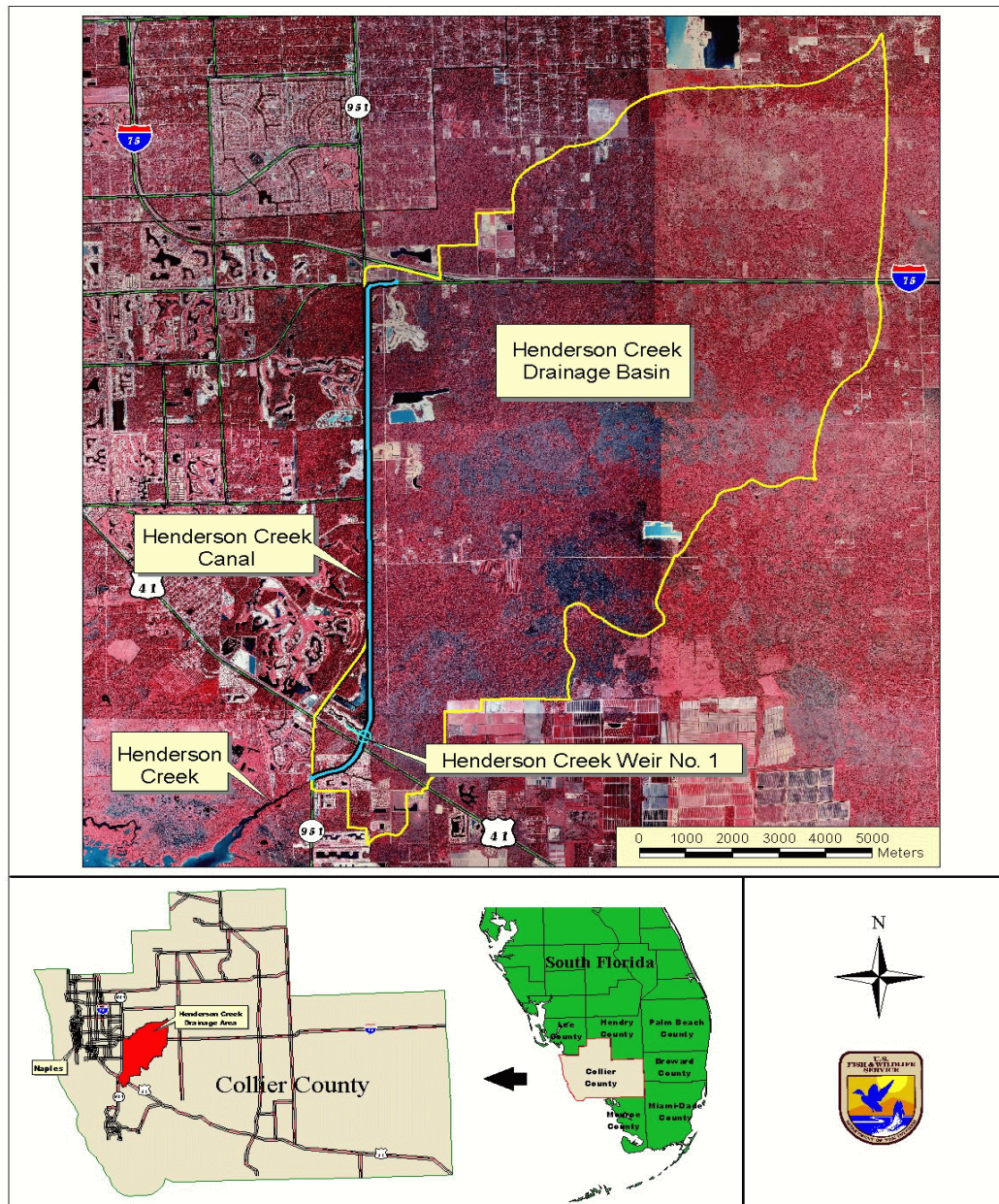


Figure 93-1. Location of the Henderson Creek/Belle Meade Restoration project area.

the project sponsor, DEP's Rookery Bay National Estuarine Research Reserve, and the Service. We recognize that project features may change as a PMP is developed. This analysis will be updated when a PMP is available.

The purpose of this project is to restore surface water sheetflow, disrupted by man-made structures (roads, canals, and other developments), to the estuaries of the Rookery Bay and Cape Romano-Ten Thousand Islands Aquatic Preserves at Rookery Bay National Estuarine Research Reserve. This project will aid in restoring the historical timing, quality, quantity and duration of freshwater entering the estuaries, benefitting many important commercial and recreational finfish and shell fish species that are dependent on these freshwater flows. The project works to hydrologically connect the freshwater watershed with the estuaries downstream, thereby enhancing the entire ecosystem while treating stormwater before it reaches the estuaries. The project involves five components.

Culverts under CR 951

Four large box culverts were recently placed under County Road 951 to increase surface water flow from the east side of the road to the west side of the road. While these culverts have improved surface water flow, four additional culverts are needed because these four original culverts are occasionally filled beyond capacity.

Status: We will have to determine whether four culverts are needed or not, but culverts under CR 951 are still part of the plan.

Project footprint: Maximum footprint would be 0.50 acre for all four culverts. This area is currently located in disturbed roadside habitat.

Stormwater Management System

Two parcels of land, located adjacent to Henderson Creek Canal and south of Henderson Creek weir and U.S. 41, are being considered for purchase under the State Conservation And Recreation Lands Program. The plan would include construction of a stormwater management system on these lands which would funnel water from the Henderson Creek canal through this system, "scrubbing" the water before it reaches the estuary. Water levels in the canal and stormwater management lake would be managed through the development of an operational plan for the Henderson Creek weir. Currently, Rookery Bay National Estuarine Research Reserve staff are collecting water quality data, including salinity to identify current problems with the release of freshwater (through the weir) to the estuary. These problems could then be addressed within the operational plan. Invasive plants would also be removed on project lands, reducing the distribution of exotic plants in the project area.

Status: One parcel has been purchased by the State (approximately seven acres along U.S. 41). The other parcel is being developed. The 7-acre parcel Rookery Bay National Estuarine

Research Reserve currently owns near the project area is in the process of being swapped for seven acres of private land adjacent to Henderson Creek. The Rookery Bay National Estuarine Research Reserve parcel is highly disturbed, containing grassy groundcover with cabbage palms and a couple of pine trees. The area Rookery Bay National Estuarine Research Reserve is interested in obtaining is more diverse and contains cabbage palms, more pine trees, some native shrubs (saw palmetto) and invasive plants (Brazilian pepper, earleaf acacia). Our analysis assumes that these lands will be swapped, so any effects from the project will occur in the 7-acre private parcel along Henderson Creek.

Project footprint: The maximum footprint would be about 4 acres. The habitat type we expect to exist in the new stormwater management lake would be freshwater wetlands with pickerelweed along an extensive littoral shelf, and some open water in an interior 'sink' area.

Hydrologic Restoration around Manatee Basin

Four parcels draining into the Manatee Basin have been targeted for acquisition through the State's Conservation And Recreation Lands Program. These include: (1) the purchase of a 78-acre parcel adjacent to the Manatee Basin, south of U.S. 41; (2) a 67-acre parcel purchased by Collier County and donated to the State in 1999, north of U.S. 41; (3) about 10 acres being donated to State as partial mitigation for the Winding Cypress development; and (4) a 25-acre on-site wetland put aside as a conservation easement. For the purposes of this analysis, we will assume that (3) and (4) are not part of CERP land acquisition since they were mitigation for previous development activities. This leaves 145 acres of wetlands that will be acquired and managed as wetlands in the CERP. Restoration activities would involve the installation of additional culverts under U.S. 41. The size of these culverts would have to be determined through hydrological studies. Existing drainage ditches would be filled to the adjacent grade. A berm would be placed along the southern boundary of these parcels to prevent any flooding of residential neighborhoods to the south due to restoration efforts. Currently, a Florida Power and Light powerline access road bisects the property. This road would be returned to the at-grade level and GeoWeb materials would be installed to provide access. The GeoWeb materials will allow maintenance crews to access the powerline, while restoring surface water sheetflow to the system. Invasive plants would also be removed, reducing the distribution of exotic plants in the project area.

Project footprint: Maximum footprint would be approximately three to five acres for the culverts, berm, leveled road and filled drainage ditches. The details of where these features would be sited have not been worked out. For purposes of this analysis, we have assumed that this effect would occur in disturbed roadside areas and that the degraded powerline access road would not be returned to native vegetation.

Construction of Swale and Spreader Systems

An eastern and western overflow swale system would be constructed from the U.S. 41 canal to reintroduce freshwater to McIlvane Marsh and the Ten Thousand Islands. Currently, the canal and culvert system under the U.S. 41 is insufficient in conveying freshwater from north of U.S. 41 south to McIlvane Marsh and the estuaries of the Ten Thousand Islands. Planning documents for this work have already been completed by the Collier County Stormwater Management Department, but funding has limited the implementation aspect. During the rainy season, the U.S. 41 canal fills with freshwater. When this freshwater reaches a specified level, the water would overflow into these two broad swale and spreader systems that would then convey the water south. Residential and agricultural development south of U.S. 41 currently limits the conveyance of surface water sheetflow.

Project footprint: The maximum footprint would be about two to three acres. This area currently consists of disturbed and grassy areas, and we expect short hydroperiod wetlands would be created in the swale and spreader system.

Road-to-Nowhere Removal

This road was placed in McIlvane Marsh in the late 1960s as part of a development plan. Soon after, this area was deeded over to the State as part of the Deltona Settlement Agreement. Southern States Utilities has an outfall pipe for gray water that runs from its sewage treatment plant inland out into the marsh system. In the past, the pipe was used during high volume periods to get rid of excess treated water. Presently, this pipe is not used regularly and has not been used recently. The goal of this aspect of the project is to remove the pipe and road to restore the mangrove/salt marsh community. During recent biological surveys, a population of American crocodiles was found in this area. As many as eleven adult crocodiles have frequented man-made borrow pits at the Marco Airport site. These crocodiles have repeatedly nested unsuccessfully on the adjacent Road-to-Nowhere. The removal of all or portions of this road would be accomplished in coordination with the FWC and the Service to avoid adverse effects to this listed species during road removal.

Status: The length of road to be removed is still unknown. For the purposes of this analysis we have assumed that the total area of road removal will be 1.5 acres.

Threatened and Endangered Species and Designated Critical Habitats Pertinent to Henderson Creek/ Belle Meade Restoration

West Indian manatee

About one to three manatees use Henderson Creek on an average day and manatees congregate in this area in the winter months. This project should benefit the manatee by protecting headwater habitat. However, manatees could be directly harmed or harassed during construction activities and the Service's Standard *Manatee Protection Construction Conditions for Aquatic-related Activities* should be implemented during project construction.

American crocodile

An estimated 11 adult American crocodiles occur within the vicinity of Road-To-Nowhere. American crocodiles use Road-to-Nowhere to rest or to bask and have unsuccessfully attempted to nest on the road. The preliminary recommendation would be to remove portions of the road to create islands. This would help with water flow while retaining resting sites for the crocodiles. In addition, it will also push the raccoons, who routinely destroy the nests, to swim island to island, giving the crocodiles a chance to defend their nests. Restoration of a more natural hydrological regime will improve crocodile habitat, specifically salt marsh in the surrounding area. For the purposes of this report, we have assumed that 1.5 acres of resting habitat will be lost. Since this 1.5 acres would be restored back to mangrove wetlands that are suitable crocodile foraging habitat, no net loss will be tallied.

Bald eagle

There are two eagle nests in the Rookery Bay region, located about 1.5 miles to the north and south of Henderson Creek. Since these nests are too far away to be affected by project construction activities, no adverse effects are anticipated. The stormwater management lake may provide a negligible amount of bald eagle foraging habitat within the open water area.

Wood stork

The project site is located outside of the CFAs of known wood stork colonies, including the colony at National Audubon Society's Corkscrew Swamp Sanctuary and a small colony north of Florida Panther National Wildlife Refuge. Although wood storks have not been observed foraging onsite, the freshwater wetlands at the headwaters of Henderson Creek are potential wood stork habitat. The 145 acres of wetlands that will be acquired and managed as part of this project should benefit the wood stork.

Red-cockaded woodpecker

Red-cockaded woodpeckers are found 4 miles north of the project, which is beyond their foraging range, and are unlikely to be effected by the Henderson Creek project.

Florida panther

The GIS database at the South Florida Ecological Services Office indicates that two Florida panthers (numbers 60 and 92) and three Texas cougars (numbers 101, 104, and 106) have been recorded within 5 miles of the project site between 1995 and 2002 and represent day rest sites used by the cats. According to the telemetry data generated on these animals the project site is on the southwestern edge of their occupied habitat. None of the project features fall within the panther planning zones.

Eastern indigo snake

The project sites consist of freshwater wetlands with scattered uplands and disturbed roadside habitat. The project area provides potential habitat for the eastern indigo snake. Indigo snakes could be harmed through loss of approximately 5.5 acres of disturbed roadside area. An additional 4 acres of mixed shrub habitat would be effected as part of the stormwater management system.

Land acquisition of approximately 145 acres of wetland habitat could benefit the eastern indigo snake through protection and management of these areas. An additional 1.5 acres of indigo snake habitat would be converted through removal of the Road-to-Nowhere. Indigo snakes may be directly harmed or harassed during construction activities and the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction.

Coordination with the Corps and DEP

This project description is based on discussions with DEP during 2003. The Corps project manager does not want to discuss the project activities in greater detail until the Design Agreement is signed. The Design Agreement has been at Corps Headquarters for wording changes since February 2002.

Consultation documents

Section 7 consultation has not been initiated.

Lakes Park Restoration project description

The purpose of this project is to enhance surface water runoff quality by creating a marsh flow-way which will act as a natural filter to clean nutrients from water entering the lakes at Lakes Regional Park. Part of the project also involves the control of aquatic and upland exotic plant species while allowing public access into upland areas of improved native habitat. The restoration will provide immediate habitat and water quality benefits at Lakes Regional Park and improve downstream conditions in Hendry Creek and Estero Bay (Fig. 94-1).



Figure 94-1. Location of Lakes Park Restoration project in Lee County, Florida.

Benefits of the project include water quality enhancement; increased flood storage; restored habitat for wading and migratory birds; and increased spawning, breeding, and feeding habitat for numerous species of reptiles, amphibians, fish, and mammals. Among the federally protected species expected to benefit from the restoration are the endangered wood stork, American crocodile, and West Indian manatee, and the threatened bald eagle and eastern indigo snake.

The project is located within the boundaries of Lakes Regional Park. The 279-acre recreational park includes 158 acres of fresh water lakes and is located just west of U.S. 41 in the south end of Fort Myers, Florida (Fig. 94-2). The park was developed on an abandoned rock mine that contained a series of borrow pit lakes. Lee County has developed the area as a regional park that provides opportunities for fishing, canoeing, swimming, picnicking, biking, and hiking. Adjacent to the park's developed area, the remaining natural habitat contains mesic pine flatwoods, hydric pine flatwoods, freshwater marshes, and forested wetlands including cypress swamps. The borrow pit lakes capture runoff from the surrounding developed area (commercial, industrial, and residential). The entire area drains south into Hendry Creek, an Outstanding Florida Water, which flows for a few miles before entering Estero Bay.



Figure 94-2. Location of the Lakes Park Restoration project area within Lakes Regional Park, Lee County.

County monitoring has indicated a decline in water quality in the lakes. The lakes are infested with hydrilla, and adjacent uplands and islands are covered with exotic plant species such as Australian pine and Brazilian pepper. The project is expected to enhance surface water runoff

quality by creating a 40-acre meandering marsh flow-way with shallow littoral zones. Exotic vegetation will be removed and replaced with native vegetation on 11 acres of upland and 9 acres of littoral zone. The littoral zone will be harvested periodically to remove excess nutrients from the system.

The combined footprint for the marsh flow-way construction, exotic vegetation removal, and native vegetation planting would be 60 acres.

Initial effects analysis for Lakes Park Restoration

As water quality in the borrow pit lakes improves, fish and wildlife habitat will also begin to recover. The flow-way and associated littoral zones will provide diverse habitat for wildlife. Previously created flow-ways have documented use by numerous wading birds and waterfowl, including endangered wood storks, whooping cranes, and white pelicans (St. Johns River Water Management District 2001).

Among the species of state-listed wading bird species known to occur in the project area are the tri-colored heron, little blue heron, white ibis, and the snowy egret. The black skimmer, osprey, American oystercatcher, and the brown pelican are present in the Estero Bay estuary and also may be indirectly affected by the project. All of these state-listed birds are listed as species of special concern.

West Indian manatee

The endangered West Indian manatee is found regularly in Hendry Creek and the Estero Bay estuary.

Harm: Manatee mortalities have been reported within 460 feet of the project area in Hendry Creek. Manatees may be directly harmed or harassed during construction activities and the Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities* should also be implemented during project construction.

Benefits: Manatees should receive downstream benefits from the enhanced water quality resulting from the restoration.

Bald eagle

The threatened southern bald eagle is known to breed throughout the state. No nest sites occur on Lakes Regional Park, however three nest sites are located within 3.5 miles of the project area. Construction activities associated with the creation of the marsh flow-way could interrupt the foraging activities of eagles. However, bald eagles are not limited by foraging habitat.

Benefit: Bald eagles should benefit from restoration and the resulting water quality enhancement within the lakes of Lakes Regional Park. Foraging habitat quality should improve as aquatic exotic plant species are removed and replaced with native vegetation.

Wood stork

Although the project site is located outside of the CFA of all known wood stork colonies, wood storks may use the created marsh flow-way and littoral zones. Creation of a 40-acre meandering marsh flow-way with shallow littoral zones would provide additional foraging habitat for this species. Wood storks are dependent on forage fishes produced in the littoral zone. Because stocks of forage fish are expected to increase following the restoration, the project should have a long-term positive effect on the wood stork. Roosting and feeding habitat quality should improve as aquatic and upland exotic plant species are replaced with native vegetation.

American crocodile

The endangered American crocodile is found regularly in the Estero Bay estuary and has been sighted in Hendry Creek.

Benefits: American crocodiles should receive downstream benefits from the enhanced water quality resulting from the restoration.

Eastern Indigo snake

Harm: Eastern indigo snakes could be encountered during construction of the marsh flow-way. Therefore, the Service's *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction, and a qualified wildlife biologist should be present during land clearing activities, inspecting habitats for the presence of indigo snakes prior to clearing and monitoring for fleeing indigo snakes during clearing operations.

Benefit: Creation of a 40-acre meandering marsh flowway with shallow littoral zones would increase the prey base available to the eastern indigo snake. Habitat quality should also improve as aquatic and upland exotic plant species are replaced with native vegetation.

Other reptiles potentially indirectly affected in the footprint include the state-listed American alligator (species of special concern) and the gopher tortoise (listed as threatened).

Melaleuca Eradication and Other Exotic Plants project description

The Melaleuca Eradication and Other Exotic Plants project is a three-part plan to enhance efforts to control invasive exotic plant species in south Florida. The three parts include: (1) design and construction of the upgrade and renovation of the existing Florida Department of Agriculture and Consumer Services biocontrol facility in Gainesville, Florida; (2) mass rearing and controlled release of biological agents throughout south Florida; and (3) preparation of a report to further identify the overall problem with exotic invasive plants and provide a recommendation regarding further Federal involvement.

Threatened and Endangered Species and Designated Critical Habitats

Part 1 - Design and Construction of the Upgrade and Renovation of the Existing Florida Department of Agriculture and Consumer Services Biocontrol Facility in Gainesville, Florida

The proposed facility would provide improvements to the Florida Biological Control Laboratory facility in Gainesville, Florida. The Florida Biological Control Laboratory is primarily responsible for enforcing the quarantine procedures and regulations governing the receipt, handling, and release of introduced biological control organisms. Biological control agents are needed to provide an integrated management approach to the invasive species problems of the Florida Everglades and other Florida ecosystems. The proposed improvements to the Florida Biological Control Laboratory facility will allow accelerated research and development of biological controls for exotic plants and plant pests.

Since no additional lands will be required for this project, the Service anticipates federally listed species and designated critical habitats will not be affected by this project. Should project plans change (*i.e.*, effects to additional land areas), this determination may be reconsidered.

Part 2 - Mass Rearing and Controlled Release of Biological Agents throughout South Florida

Primary exotic plant species of concern in South Florida include melaleuca, Old World climbing fern, Brazilian pepper, and Australian pine.

Melaleuca readily invades canal banks, pine flatwoods, cypress swamps, and uninterrupted sawgrass prairies of South Florida (Myers, 1975; Austin, 1978; Woodall, 1981, 1982; Duever et al., 1986; Nelson, 1994). It grows extremely fast, producing dense stands that displace native plants, diminish animal habitat, and provide little food for wildlife (Laroche and Ferriter 1992).

There are two species of exotic climbing fern naturalized in Florida. Old World climbing fern is native to wet tropical and subtropical regions of Asia, Africa, and Australia. It has become a serious threat to South Florida natural areas, especially the Everglades, where it is increasing in density and range. Japanese climbing fern is native to temperate and tropical Asia. It occurs

from eastern Texas through the southern states to North Carolina and northern Florida. Old World climbing fern has reached a critical mass in South Florida such that new populations, presumably from wind-borne spores, are constantly being reported by natural resource managers and private landowners throughout the southern peninsula. Old World climbing fern invades many freshwater and moist habitats in Florida. It is common in cypress swamps, pine flatwoods, wet prairies, sawgrass marshes, mangrove communities, and Everglades tree islands (Jewell, 1996; Pemberton and Ferriter, 1998). Old World climbing fern threatens to dominate many native plant communities in South Florida and Central Florida within the next decade (Ferriter, 1999a).

Brazilian pepper has invaded a variety of areas, including but not limited to fallow farmland, pinelands, hardwood hammocks, roadsides, and mangrove forests. It is found in areas with a high degree of disturbance as well as in natural areas with little disturbance (Woodall, 1982; Ferriter, 1997). Brazilian pepper forms dense thickets of tangled woody stems that completely shade out and displace native vegetation. It has displaced some populations of rare, listed species such as the beach jacquemontia, a state and federally listed endangered species, and beach star, a state listed endangered species.

Australian pine was introduced to Florida in the late 1800s (Morton, 1980). It naturalized since the early 1900s along coastal dunes (Small, 1927). Australian pine was planted extensively in the southern half of the state as windbreaks and shade trees (Morton, 1980). It is salt tolerant and seeds freely throughout the area, growing even in front-line dunes (Watkins, 1970; Long and Lakela, 1971). Its rapid growth, dense shade, dense litter accumulation, and other competitive advantages are extremely destructive to native vegetation (Nelson, 1994). Australian pine can encourage beach erosion by displacing deep-rooted native vegetation, and it can interfere with the nesting of endangered sea turtles and the American crocodile (Klukas, 1969).

Introduction of animals such as cattle, sheep, goats, weed eating fish, or other non-host specific organisms has also been used to control certain invasive plants (Center et al. 1997; Simberloff et al. 1997). However, environmental effects of using such nonselective herbivores (biomechanical agents), especially in natural areas, should be carefully considered before implementation. Non-specific "biomechanical" organisms are not considered classical biological control agents. In general, acceptable biological control only comes from host-specific agents (Williamson 1996), particularly in natural areas. Non host-specific agents, while useful in many contexts, often have broad non-target effects, and in some cases have caused serious ecological effects themselves (Cullen and Delfosse 1990; Briese 1993; Lockwood 1993; Hoffmann 1995; Simberloff and Stilling 1996; Center et al. 1997; Goolsby 1999). The use of biological controls should be carefully considered in all cases (Simberloff and Stilling 1996).

This portion of the plan is aimed at developing biological control agents that will effectively control *melaleuca* or, at least, contribute towards control in an integrated management system. The scope is broad, covering a complete, beginning-to-end biological control project, including

foreign exploration, overseas screening, quarantine follow-up, field colonization, performance assessment, and technology transfer.

The plans for long-term management and control of melaleuca using biological control are contingent upon finding an agent or agents that are host-specific, thus removing melaleuca while not negatively affecting native vegetation. Previously, the Service has indicated that biological control has the potential to be the most environmentally damaging alternative, and therefore, requested consultation associated with any such proposal (Corps 1996). As mentioned above, biological control agents will need to be specific for melaleuca, and as such, should not result in predatory effect upon native floral species, particularly threatened or endangered plant species.

A key component of an effective and long-lasting melaleuca management program is the introduction of biological control agents. Without biological control, melaleuca elimination will be much more expensive and could not be truly integrated. The first releases of a melaleuca snout beetle began in April 1997. As of August 2003, more than 18,000 larvae and 210,000 adults have been released at 150 different locations in twelve counties. Melaleuca snout beetle larvae are flush feeders, consuming the seasonal flush of newly developed, expanding leaves at branch tips. Severe larval feeding results in tip dieback, defoliation, and reduced flowering. In recent studies, for instance, an 80-percent reduction in flowering was observed among damaged melaleuca trees as compared to a similar undamaged group. The melaleuca snout beetle is the first of a suite of insects that is being studied for release.

The second melaleuca biocontrol agent was released from quarantine in February 2002. Approximately 350,000 psyllids (*Boreioglycaspis melaleucae*) have now been released, and the agent has established at 23 sites in South Florida. Populations are building quickly and have spread as much as 20 miles from the release points. Nymphs suck the plant juices and inject a phytotoxic saliva that kills the tissue surrounding the feeding site. Although only a short time has elapsed since the release of the insect, preliminary data have shown that psyllid attack results in a 60-percent mortality rate among seedlings after a single year of introduction. Entomologists analyzing the problem estimate that four to five insect species will be required to effectively suppress melaleuca's invasive capacities.

The U.S. Department of Agriculture quarantine process should assure that any biological control agents selected for use will have no adverse effects upon threatened and endangered species. Long-term control of melaleuca should result in a net benefit to threatened and endangered species through the reestablishment of native plant communities throughout the State of Florida. These native plant communities are necessary to support threatened and endangered species.

Threatened and endangered species are numerous in Florida, and each treatment area may have its own listed species. For example, in melaleuca treatment areas within the Lake Okeechobee Watershed Region, the Okeechobee gourd must be considered, while the Everglade snail kite and the apple snail, the preferred food source of the Everglade snail kite, may be of concern for the Everglades region, including the WCAs. Threatened and endangered species for each melaleuca

treatment area in Florida must be documented on a case-by-case basis. After determining which listed plant and animal species may reside in a treatment area, consultation with the Service will provide information necessary to determine which management methodology should be employed for the protection of listed species. The Service would like to be involved in the decision-making process for sensitive areas such as critical habitat or other ecologically-significant areas. The MSRP should be reviewed to determine the potential for federally listed threatened and endangered species to occur in the treatment areas.

Part 3 - Preparation of a Report to Further Identify the Overall Problem with Exotic Invasive Plants and Provide a Recommendation Regarding Further Federal Involvement

No adverse effects to threatened and endangered species are anticipated by this action.

Seminole Tribe Big Cypress Reservation Water Conservation Plan project description

The Seminole Tribe Big Cypress Reservation Water Conservation Plan project is located on the Seminole Tribe Big Cypress Reservation in Hendry County, north of the BCNP and west of WCA 3A. This Other Project Element includes water conveyance, canal bypass structures, irrigation storage cells, and water resource areas to improve water quality and runoff, reduce flood damage, and promote water conservation within the Seminole Tribe Big Cypress Reservation. Natural treatment in pretreatment cells and water storage areas will remove agricultural pollutants. The project will restore environmental conditions on the Seminole Tribe Big Cypress Reservation, BCNP, and central and southern Everglades. The original overall plan was divided into east and west portions. The Critical Project includes most of the work described under CERP Seminole Big Cypress component and the Seminole Tribe is pursuing all features under the Critical Projects program. The Seminole Tribe is attempting to complete the balance of the CERP project in the East Basin in partnership with the Natural Resources Conservation Service.

The Corps issued permit #199800622 IP-FF, dated July 16, 1999, to the Seminole Tribe for construction of the Water Conservation Plan for the Critical Restoration Project (authorized under Section 528(b)(3) of the Water Resources Development Act of 1996, P.L. 104-303). Special Condition number two of the permit requires that the Seminole Tribe develop a Wetland Management Plan prior to construction in the western basins. Service, Corps, and Seminole Tribe ongoing coordination includes annual monitoring of listed species as described in the June 11, 1999, Biological Opinion (Service Log Number 4-1-98-F- 398) and participating in development of a Wetland Management Plan. The Wetland Management Plan is being developed by the Corps' South Atlantic Jacksonville, Regulatory Division, Special Projects and Enforcement Branch and the Seminole Tribe as part of the benefits analysis for the Critical Project. Because there is a Clean Water Act section 404 permit, Corps Regulatory will be taking over Service and Environmental Protection Agency coordination of the Permit's Special Conditions. The Corps received a draft Wetland Management Plan on September 24, 2003, and will forward it to the Service and the Environmental Protection Agency for comment once their review is finalized.

Because this project is not being pursued as part of the CERP, effects of the project on threatened and endangered species will not be tallied for purposes of this report and will not be included in the future programmatic consultation on the CERP.

State-listed Species

Introduction

The Office of Environmental Services of the FWC has prepared this section on state-listed species potentially occurring within the footprints or study areas of the CERP projects. The information presented only covers state-listed species that are not also listed by the Service (Table FWC-1). In this initial evaluation, we defer to the Service's report and recommendations for those species listed by both the FWC and the Service. We will continue to provide additional comments on all state-listed species on a project-by-project basis through PDT meetings and associated correspondence.

Table FWC-1. Species listed by the Florida Fish and Wildlife Conservation Commission (FWC) potentially occurring within Comprehensive Everglades Restoration Plan (CERP) project boundaries. This table does not include species that are also federally listed.

E - Endangered, T - Threatened, SSC - Species of Special Concern.

Common Name(s)	Scientific Name	FWC Status
FISH		
Key silverside	<i>Menidia conchorum</i>	T
Mangrove rivulus; rivulus	<i>Rivulus marmoratus</i>	SSC
AMPHIBIANS		
Gopher (=crawfish) frog	<i>Rana capito</i>	SSC
REPTILES		
Florida Keys mole skink	<i>Eumeces egregius egregius</i>	SSC
Gopher tortoise	<i>Gopherus polyphemus</i>	SSC
Florida pine snake	<i>Pituophis melanoleucus mugitus</i>	SSC
Short-tailed snake	<i>Stilosoma extenuatum</i>	T
Miami black-headed snake; rimrock crowned snake	<i>Tantilla oolitica</i>	T
BIRDS		
Roseate spoonbill	<i>Ajaia ajaja</i>	SSC
Limpkin	<i>Aramus guarauna</i>	SSC
Southeastern snowy plover	<i>Charadrius alexandrinus tenuirostris</i>	T
White-crowned pigeon	<i>Columba leucocephala</i>	T
Little blue heron	<i>Egretta caerulea</i>	SSC
Reddish egret	<i>Egretta rufescens</i>	SSC
Snowy egret	<i>Egretta thula</i>	SSC

Table FWC-1 (cont.). Species listed by the Florida Fish and Wildlife Conservation Commission (FWC) potentially occurring within CERP project boundaries. This table does not include species that are also federally listed.

E - Endangered, T - Threatened, SSC - Species of Special Concern.

Common Name(s)	Scientific Name	FWC Status
BIRDS (continued)		
Tricolored (=Louisiana) heron	<i>Egretta tricolor</i>	SSC
White ibis	<i>Eudocimus albus</i>	SSC
Southeastern American kestrel	<i>Falco sparverius paulus</i>	T
Florida sandhill crane	<i>Grus canadensis pratensis</i>	T
American oystercatcher	<i>Haematopus palliatus</i>	SSC
Osprey	<i>Pandion haliaetus</i>	SSC
Brown pelican	<i>Pelecanus occidentalis</i>	SSC
Black skimmer	<i>Rynchops niger</i>	SSC
Burrowing owl	<i>Speotyto cunicularia</i>	SSC
Least tern	<i>Sterna antillarum</i>	T
MAMMALS		
Sherman's short-tailed shrew	<i>Blarina carolinensis</i> (= <i>brevicauda</i>) <i>shermani</i>	SSC
Florida (=Wagner's) mastiff bat	<i>Eumops glaucinus floridanus</i>	E
Everglades mink	<i>Mustela vison evergladensis</i>	T
Florida mouse	<i>Podomys floridanus</i>	SSC
Big Cypress (=mangrove) fox squirrel	<i>Sciurus niger avicennia</i>	T
Sherman's fox squirrel	<i>Sciurus niger shermani</i>	SSC
Florida black bear	<i>Ursus americanus floridanus</i>	T
MOLLUSC		
Florida tree snail	<i>Liguus fasciatus</i>	SSC

The discussion of species impacts in this report is limited to potential benefits and impacts occurring within the CERP project footprints or study areas, and does not consider upstream or downstream effects of projects. Since most projects' footprints involve creation or alteration of non-natural structures, such as canals, levees, stormwater treatment areas (STAs), or reservoirs, the immediate effects on co-located upland and wetland species will likely be negative in many cases. Although habitat in the project footprints may not be enhanced, the natural areas upstream and downstream of the footprints should benefit as a result of the water storage and improved water quality associated with project operation. Additionally, it is possible for projects to increase the fish and wildlife habitat value of artificial features within the project footprint.

The Service is currently working with other agencies, including the FWC, to develop a set of recommendations for fish and wildlife habitat enhancements in STAs and reservoirs. We recommend that projects involving construction of STAs or reservoirs include some of these enhancements, such as littoral shelves, natural vegetated islands, buffer zones of native vegetation, or deep-water refugia to provide some fish and wildlife benefits, as long as the inclusion of these features does not compromise the primary project objectives. Additionally, where feasible, we support the restoration of wetlands and uplands within project footprints as a means of providing aquifer recharge, water quality improvement, wildlife habitat, and (in the case of wetlands) surface water storage.

In this section, we present a summary of the potential habitat acres for state-listed species occurring within CERP project footprints or project study areas, with the recommendation that appropriate measures be taken to survey for these species and avoid impacts. We also present acres of project footprints or study areas overlapping with Strategic Habitat Conservation Areas (SHCAs) for listed species, with the recommendation that these areas be avoided in siting of constructed project features. For discussion of projects' potential impacts and benefits, state-listed species are grouped together into species-habitat assemblage groups according to their primary habitat preferences. The primary habitat groups discussed are the marsh-swamp-wetland shrub complex, the xeric upland complex, the upland-swamp complex, and the coastal complex of species.

Methods

Potential Habitat for State-listed Species

To predict which habitats were likely to contain listed species, literature describing the habitat preferences of species was reviewed and documented in a species-habitat matrix (Table FWC-2a and Table FWC-2b). County distribution information from Florida Natural Areas Inventory (Hipes et al. 2001) was used to further define areas of potential habitat. Project footprints and study areas were gathered from a variety of sources (Table FWC-3). Where available, the District coverage of project boundaries (<http://www.sfwmd.gov/org/gisit/index.html>) was used to delineate footprints. Where this information was either not available or not current, polygons were digitized using hardcopy maps of proposed project features or study areas. In some cases, the actual project footprint, once it is more clearly defined by the PDT, will only occupy a portion of the acreage of digitized boundaries. Therefore, species' potential habitat acreages should be interpreted with caution, and should be used as a guide for further surveys and impact assessments. As the footprints of projects are further developed, we will refine our assessment of state-listed species' impacts through participation in PDTs.

Table FWC-2a. Predicted habitat use by state-listed species (American oystercatcher through least tern) based on review of literature describing the species habitat preferences. Columns represent the state-listed species being evaluated, and the rows represent the 2003 draft FWC landcover classes occurring within the Comprehensive Everglades Restoration Plan (CERP) study area.

Species	American oystercatcher	Big Cypress fox squirrel	Black skimmer	Brown pelican	Everglades mink	Florida black bear	Florida burrowing owl	Florida Keys mole skink	Florida mastiff bat	Florida mouse	Florida pine snake	Florida sandhill crane	Florida tree snail	Gopher frog	Gopher tortoise	Key silverside	Least tern
Land Cover																	
Agriculture																	
Citrus																	
Improved Pasture							X					X			X		
Other ag												X					
Row/Field Crops												X					
Sugarcane			X														
Unimproved Woodland/Pasture							X				X	X			X		
Beach																	
Sand/Beach	X		X					X									X
Upland Forest																	
Australian pine																	
Exotic Plants															X		
Hardwood-Cabbage Palm		X				X			X								
Mixed Hardwood-Pine		X				X			X					X	X		
Pineland		X				X			X	X	X			X	X		
Tropical Hardwood Hammock		X			X	X			X				X				
Upland Hardwood Hammock		X			X	X			X			X		X	X		
Upland Herbaceous																	
Coastal Strand	X		X					X							X		X
Dry Prairie							X			X	X	X			X		
Grassland							X			X	X	X			X		
Upland Shrub																	
Brazilian Pepper															X		
Sand Pine Scrub							X			X	X			X	X		
Sandhill							X			X	X			X	X		
Shrub and Brushland							X			X	X				X		

Species	American oystercatcher	Big Cypress fox squirrel	Black skimmer	Brown pelican	Everglades mink	Florida black bear	Florida burrowing owl	Florida Keys mole skink	Florida mastiff bat	Florida mouse	Florida pine snake	Florida sandhill crane	Florida tree snail	Gopher frog	Gopher tortoise	Key silverside	Least tern
Land Cover																	
Xeric Oak Scrub							X			X	X			X	X		
Water																	
Open Water			X	X										X		X	X
Swamp																	
Australian pine																	
Bay Swamp		X				X			X								
Cypress Swamp		X			X	X			X								
Cypress-Pine-Cabbage Palm		X			X	X			X								
Exotic Plants																	
Hardwood Swamp		X			X	X			X								
Wetland Forested Mixed		X			X	X			X								
Marsh																	
Coastal Salt Marsh	X		X	X	X												X
Fresh Marsh and Wet Prairie					X							X					
Fresh marsh dom by cattail					X												
Fresh marsh dom by sawgrass					X												
Tidal Flat	X		X	X													X
Wetland Shrub																	
Brazilian Pepper				X													
Mangrove Swamp		X	X	X					X							X	
Shrub Swamp																	
Urban																	
Extractive																	X
High Impact Urban									X								X
Low Impact Urban		X	X				X		X			X			X		X
Sand																	
Bare Soil/Clearcut							X							X	X		X

Table FWC-2b. Predicted habitat use by state-listed species (limpkin through white-crowned pigeon) based on review of literature describing the species habitat preferences. Columns represent the state-listed species being evaluated, and the rows represent the 2003 draft FWC landcover classes occurring within the Comprehensive Everglades Restoration Plan (CERP) study area.

Species	Limkin	Little blue heron	Mangrove rivulus	Miami black-headed snake	Osprey	Reddish egret	Roseate spoonbill	Sherman's fox squirrel	Sherman's short-tailed shrew	Short-tailed snake	Snowy egret	Southeastern American kestrel	Southeastern snowy plover	Tricolored heron	White ibis	White-crowned pigeon
Agriculture																
Citrus																
Improved Pasture									X			X				
Other ag																
Row/Field Crops																
Sugarcane	X															
Unimproved Woodland/Pasture				X				X	X	X		X				
Beach																
Sand/Beach													X			
Upland Forest																
Australian pine																
Exotic Plants																
Hardwood-Cabbage Palm																
Mixed Hardwood-Pine								X		X						
Pineland				X				X		X		X				
Tropical Hardwood Hammock				X												X
Upland Hardwood Hammock									X							
Upland Herbaceous																
Coastal Strand													X			
Dry Prairie								X				X				
Grassland									X			X				
Upland Shrub																
Brazilian Pepper																
Sand Pine Scrub								X		X		X				
Sandhill								X		X		X				

Species	Limkin	Little blue heron	Mangrove rivulus	Miami black-headed snake	Osprey	Reddish egret	Roseate spoonbill	Sherman's fox squirrel	Sherman's short-tailed shrew	Short-tailed snake	Snowy egret	Southeastern American kestrel	Southeastern snowy plover	Tricolored heron	White ibis	White-crowned pigeon
Land Cover																
Shrub and Brushland										X		X				
Xeric Oak Scrub								X		X		X				
Water																
Open Water	X	X			X	X					X			X	X	
Swamp																
Australian pine																
Bay Swamp	X	X			X						X			X	X	
Cypress Swamp	X	X			X						X			X	X	
Cypress-Pine-Cabbage Palm	X	X			X						X			X	X	
Exotic Plants																
Hardwood Swamp	X	X			X						X			X	X	
Wetland Forested Mixed	X	X			X						X			X	X	
Marsh																
Coastal Salt Marsh		X	X			X	X				X			X	X	
Fresh Marsh and Wet Prairie	X	X					X				X			X	X	
Fresh marsh dom by cattail	X	X					X				X			X	X	
Fresh marsh dom. By sawgrass	X	X					X				X			X	X	
Tidal Flat						X	X				X		X	X	X	
Wetland Shrub																
Brazilian Pepper		X				X	X				X			X	X	
Mangrove Swamp	X	X	X		X	X	X				X			X	X	X
Shrub Swamp	X	X					X				X			X	X	
Urban																
Extractive																
High Impact Urban																
Low Impact Urban		X		X				X	X		X			X	X	
Sand																
Bare Soil/Clearcut										X			X			

Table FWC-3. Sources and methods used to delineate Comprehensive Everglades Restoration Plan (CERP) project footprints for initial analysis of potential impacts to state-listed species.

WBS	CERP Project	Polygon Source
1	Lake Okeechobee Watershed Project	Coverage of project area from the Service
2	Lake Istopoga Regulation Schedule	Coverage of project area from the Service
3	Lake Okeechobee ASR	District coverage of study area
4	C-43 Basin Aquifer Storage & Recovery - Part 2	District project boundary coverage of Barry Groves (C-43 reservoir and ASR proposed location)
5	C-43 Basin Storage Reservoir - Part 1	District project boundary coverage of Barry Groves (C-43 reservoir and ASR proposed location)
6	Caloosahatchee (C-43) Aquifer Storage & Recovery Pilot	District project boundary coverage of Barry Groves (C-43 reservoir and ASR proposed location)
7	Indian River Lagoon - South	coverage of project features from the Service
8	Everglades Agricultural Area Storage Reservoir - Phase 1	District project boundary coverage
10	Big Cypress/L-28 Interceptor Modifications	Digitized features based on hardcopy map
11	Flows to Northwest/Central WCA-3A	Digitized 1 mile radius circles in approximate locations of proposed structure relocations
12	WCA-3 Decomp. & Sheet Flow Enhancement - Part 1	District WCA-3A and 3B drainage basins; modified to extend slightly farther to south and east
13	WCA-3 Decomp. & Sheet Flow Enhancement - Part 2	District WCA-3A and 3B drainage basins; modified to extend slightly farther to south and east. (same boundary as Part 1)
14	Loxahatchee NWR Internal Canal Structures	WCA-1 drainage basin boundary
15	Modify Holey Land WMA Operation Plan	N/A
16	Modify Rotenberger WMA Operation Plan	N/A
17	North Palm Beach County - Part 1	Digitized coverage of study area from map on project's website
18	North Palm Beach County - Part 2	Digitized coverage of study area from map on project's website (used same boundary as Part 1)
20	Palm Beach County Ag. Reservoir - Part 1	District project boundary coverage
21	PBC Agriculture Reserve ASR - Part 2	District project coverage (same boundary as Part 1)
22	Hillsboro Aquifer Storage and Recovery - Part 2	District coverage of Site 1 Impoundment project (reservoir bounds)
23	Flow to Eastern WCA-3B	Digitized 1 mile radius circle in approximate location of proposed structure.
24	Broward County Secondary Canals	District basins C-9, C-12, C-13, and east North New River basin
25	North Lakebelt Storage Area	District project boundary coverage
26	Central Lakebelt Storage	District project boundary coverage
27	Everglades NP Seepage Management	District project coverage, and additional area out to 1 mile west of District's project boundary
25	Biscayne Bay Coastal Wetlands	District study area coverage
29	C-111 Spreader Canal	digitized from hardcopy PDT map of study area
30	Southern Golden Gate Estates Hydrologic	District project boundary coverage

WBS	CERP Project	Polygon Source
	Restoration	
31	Florida Keys Tidal Restoration	District study area coverage
32	Lake Okeechobee ASR Pilot	District coverage of Lake Okeechobee ASR study area (same boundary as Lake Okeechobee ASR)
33	Caloosahatchee Backpumping with Stormwater Treatment	District project coverage of Barry Groves (C-43 reservoir and ASR proposed location)
34	Hillsboro Aquifer Storage & Recovery Pilot	District coverage of Site 1 Impoundment project (reservoir bounds)
35	Lake Belt Pilot Project	Digitized selected pilot location (Stairstep N), based on hardcopy map
36	L-31N Seepage Management Pilot	District project coverage, and additional area out to 1 mile west of District's project boundary (same boundary as used for Everglades National Park seepage management project)
37	Wastewater Reuse Technology Pilot	District project coverage (same boundary as South Miami-Dade Reuse project)
38	Acme Basin B Discharge	Hardcopy map of Acme Basins A and B
39	Strazzula Wetlands	District project boundary coverage
40	Hillsboro Site 1 Impoundment	District coverage of Site 1 Impoundment project (reservoir bounds)
43	Bird Drive Recharge Area	District project boundary coverage
44	Aquifer Storage & Recovery Regional Study	N/A
45	Broward County Water Preserve Area (WPA)	District project boundary coverage
46	C-4 Structure	Digitized 1 mile radius circle in approximate location of proposed structure
47	WCA-3A/3B Flows to Central Lake Belt	Used same boundary as WCA2B flows to Everglades NP project, because proposed features of the two projects overlap
48	WCA-2B Flows to Everglades National Park	Digitized 2 mile wide polygon along length of canal proposed for widening
49	WPA Conveyance	District project boundary coverage
90	Miccosukee Water Management Plan	District project boundary coverage
91	Winsberg Farm Wetland Restoration	District project boundary coverage
92	Restoration of Pineland and Hardwood Hammocks in C-111	District project boundary coverage
93	Henderson Creek / Belle Meade Restoration	District project boundary coverage
94	Lakes Park Restoration	District coverage
95	Melaleuca Eradication, Other Exotic Plants	N/A
96	Seminole Tribe Big Cypress Reservation Water Conservation Plan	District project boundary coverage
97	West Miami-Dade Reuse	N/A
98	South Miami-Dade Reuse	District project boundary coverage

Table FWC-4 summarizes the acres of potential habitat for state-listed species within each project footprint or study area, based on species' habitat preferences from the literature, species' county distributions, the FWC 2003 draft landcover map, and best professional judgment. Maps of land cover, counties, and project boundaries were combined to determine the acreage of each habitat type by county within each project footprint. First, we used the "Intersect Themes" tool in ArcView 3.2 to create a map with project footprints divided into separate polygons by county. We then summed the areas of individual landcover classes occurring within each of the project-county polygons, using the "Summarize Areas" feature in ArcView 3.2 Spatial Analyst. For each species, acres associated with preferred habitat types occurring within the species' county distribution were then summed by project. Upon review, staff biologists found that often the county distribution was too coarse, resulting in species occurring in project footprints which were outside of their known ranges, but within their county distribution. Therefore, we modified the table to remove obvious outliers, based on a review of the literature and best professional knowledge (Rodgers et al. (eds.) 1996, Hipes et al. 2001, Moler [ed.] 1992, Humphrey [ed.] 1992).

Table FWC-4. Initial analysis of potential habitat acres for state-listed species in Comprehensive Everglades Restoration Project (CERP) project footprints¹ or study areas², based on literature review of habitat preferences, species' distributions, the FWC 2003 Draft landcover map, and best professional knowledge. This table does not include species that are also federally listed.

WBS	Project Name	American oyster-catcher	Big Cypress fox squirrel	Black skimmer	Brown pelican
1	Lake Okeechobee Watershed Project ²	0	0	6,826	2,082
2	Lake Istopoga Regulation Schedule ²	0	0	480	85
3,32	Lake Okeechobee ASR and pilot ASR ²	0	8,987	68,268	4,754
4,5,6,33	C-43 Reservoir, ASR, Backpumping with Treatment ¹	0	104	0	0
7	Indian River Lagoon - South ¹	0	0	2,463	1,367
8	Everglades Agricultural Area Storage Reservoir - Phase 1 ¹	0	22	35,728	77
10	Big Cypress/L-28 Interceptor ¹	0	15,772	208	208
11	Flows to Northwest and Central WCA-3A ¹	0	0	73	73
12,13	WCA-3 Decomp & Sheet Flow Enhancement - Part ²	0	0	9,426	9,350
14	Loxahatchee NWR Internal Canal Structures ²	0	0	9,392	3,769
17,18	North Palm Beach County - Parts 1 & 2 ²	619	0	84,995	32,784
20,21	PBC Agricultural Reserve Reservoir - Parts 1 & 2 ¹	0	0	216	50
22,34,40	Hillsboro ASR, Site 1 Impoundment, ASR pilot ¹	0	0	53	30
23	Flow to Eastern WCA-3B ¹	0	0	24	24
24	Broward County Secondary Canals ²	0	0	27,836	8,313
25	North Lakebelt Storage Area ¹	0	0	1,258	1,144
26	Central Lakebelt Storage ¹	0	0	1,636	1,595
27,36	Everglades NP & L-31N Seepage Management projects ²	0	0	1,652	793
28	Biscayne Bay Coastal Wetlands ²	2	0	11,621	10,734
29	C-111 Spreader Canal ²	0	0	34,238	34,154
30	Southern Golden Gate Estates Hydrologic Restoration ¹	0	42,914	220	456
31	Florida Keys Tidal Restoration ²	0	0	1,914	1,863
35	Lake Belt Pilot Project ¹	0	0	5	0
37,98	Wastewater Reuse Technology Pilot, South Miami-Dade Reuse ¹	0	0	70	48
38	Acme Basin B ²	0	0	6,526	723
39	Strazzula Wetlands ¹	0	0	64	23
43	Bird Drive Recharge Area ¹	0	0	26	12
45	Broward County Water Preserve Area (WPA) ¹	0	0	336	221
46	C-4 Structure ¹	0	0	253	46
47	WCA-3A/3B Flows to Central Lake Belt ²	0	0	1,079	532
48	WCA-2B Flows to Everglades National Park ²	0	0	1,079	532
49	WPA Conveyance ¹	0	0	0	0
90	Miccosukee Water Management Plan ¹	0	0	306	306
91	Winsberg Farm Wetland Restoration ¹	0	0	26	2
92	Restoration of Pineland, Hardwood Hammocks in C-111 ¹	0	0	0	0
93	Henderson Creek / Belle Meade Restoration ¹	0	29,888	118	49
94	Lakes Park Restoration ¹	0	149	156	147
96	Seminole Tribe Big Cypress Water Conservation Plan ¹	0	23,200	9	9
	TOTAL acres of potential habitat identified	621	121,036	308,582	116,354

Table FWC-4 (cont.). Initial analysis of potential habitat acres for state-listed species in Comprehensive Everglades Restoration Project (CERP) project footprints¹ or study areas², based on literature review of habitat preferences, species' distributions, the FWC 2003 Draft landcover map, and best professional knowledge. Does not include species that are also federally listed.

WBS	Project Name	Everglades mink	Florida black bear	Florida burrowing owl	Florida Keys mole skink
1	Lake Okeechobee Watershed Project ²	0	89,419	620,682	0
2	Lake Istopoga Regulation Schedule ²	0	45,026	131,381	0
3,32	Lake Okeechobee ASR and pilot ASR ²	0	6,097	85,361	0
4,5,6,33	C-43 Reservoir, ASR, Backpumping with Treatment ¹	0	90	1,109	0
7	Indian River Lagoon - South ¹	0	0	66,240	0
8	Everglades Agricultural Area Storage Reservoir - Phase 1 ¹	0	7	11,041	0
10	Big Cypress/L-28 Interceptor ¹	9,752	17,555	541	0
11	Flows to Northwest and Central WCA-3A ¹	0	671	500	0
12,13	WCA-3 Decomp & Sheet Flow Enhancement - Parts 1 & 2 ²	193,889	11,739	476	0
14	Loxahatchee NWR Internal Canal Structures ²	0	0	5,050	0
17,18	North Palm Beach County - Parts 1 & 2 ²	0	0	118,522	0
20,21	PBC Agricultural Reserve Reservoir - Parts 1 & 2 ¹	0	0	378	0
22,34,40	Hillsboro ASR, Site 1 Impoundment, ASR pilot ¹	0	0	1,147	0
23	Flow to Eastern WCA-3B ¹	1,868	0	0	0
24	Broward County Secondary Canals ²	0	0	23,832	0
25	North Lakebelt Storage Area ¹	170	0	1,272	0
26	Central Lakebelt Storage ¹	503	0	173	0
27,36	Everglades NP & L-31N Seepage Management projects ²	6,224	212	2,556	0
28	Biscayne Bay Coastal Wetlands ²	0	0	1,925	0
29	C-111 Spreader Canal ²	52,089	0	103	0
30	Southern Golden Gate Estates Hydrologic Restoration ¹	41,689	42,820	2,058	0
31	Florida Keys Tidal Restoration ²	0	0	51	0
35	Lake Belt Pilot Project ¹	4	0	18	0
37,98	Wastewater Reuse Technology Pilot, South Miami-Dade Reuse ¹	7	0	23	0
38	Acme Basin B ²	0	0	7,105	0
39	Strazzula Wetlands ¹	0	0	65	0
43	Bird Drive Recharge Area ¹	2,209	0	30	0
45	Broward County Water Preserve Area (WPA) ¹	393	0	1,788	0
46	C-4 Structure ¹	12	4	209	0
47	WCA-3A/3B Flows to Central Lake Belt ²	927	0	695	0
48	WCA-2B Flows to Everglades National Park ²	927	0	695	0
49	WPA Conveyance ¹	146	0	1	0
90	Miccosukee Water Management Plan ¹	0	12,077	5,979	0
91	Winsberg Farm Wetland Restoration ¹	0	0	137	0
92	Restoration of Pineland, Hardwood Hammocks in C-111 ¹	0	0	66	0
93	Henderson Creek / Belle Meade Restoration ¹	23,575	29,817	3,239	0
94	Lakes Park Restoration ¹	0	140	27	0
96	Seminole Tribe Big Cypress Water Conservation Plan ¹	0	24,715	14,059	0
	TOTAL acres of potential habitat identified	334,383	280,388	1,108,532	0

Table FWC-4 (cont.). Initial analysis of potential habitat acres for state-listed species in Comprehensive Everglades Restoration Project (CERP) project footprints¹ or study areas², based on literature review of habitat preferences, species' distributions, the FWC 2003 Draft landcover map, and best professional knowledge. Does not include species that are also federally listed.

WBS	Project Name	Florida mastiff bat	Florida mouse	Florida pine snake	Florida sandhill crane
1	Lake Okeechobee Watershed Project ²	0	95,337	274,184	727,474
2	Lake Istopoga Regulation Schedule ²	0	65,585	78,956	108,404
3,32	Lake Okeechobee ASR and pilot ASR ²	0	5,983	24,576	86,812
4,5,6,33	C-43 Reservoir, ASR, Backpumping with Treatment ¹	0	0	0	114
7	Indian River Lagoon - South ¹	0	24,777	27,975	68,646
8	Everglades Agricultural Area Storage Reservoir - Phase 1 ¹	0	0	0	926
10	Big Cypress/L-28 Interceptor ¹	11,903	0	0	4,198
11	Flows to Northwest and Central WCA-3A ¹	752	0	0	1,124
12,13	WCA-3 Decomp & Sheet Flow Enhancement - Parts 1 & 2 ²	0	0	0	223,366
14	Loxahatchee NWR Internal Canal Structures ²	0	0	0	57,348
17,18	North Palm Beach County - Parts 1 & 2 ²	0	134,032	139,995	170,533
20,21	PBC Agricultural Reserve Reservoir - Parts 1 & 2 ¹	0	75	75	1,063
22,34,40	Hillsboro ASR, Site 1 Impoundment, ASR pilot ¹	0	0	0	1,107
23	Flow to Eastern WCA-3B ¹	38	0	0	639
24	Broward County Secondary Canals ²	92,117	1,401	0	0
25	North Lakebelt Storage Area ¹	344	0	0	1,372
26	Central Lakebelt Storage ¹	0	0	0	398
27,36	Everglades NP & L-31N Seepage Management projects ²	1,679	0	0	5,922
28	Biscayne Bay Coastal Wetlands ²	11,576	0	0	8,742
29	C-111 Spreader Canal ²	8,932	0	0	11,008
30	Southern Golden Gate Estates Hydrologic Restoration ¹	44,464	0	0	9,646
31	Florida Keys Tidal Restoration ²	2,207	0	0	0
35	Lake Belt Pilot Project ¹	32	0	0	20
37,98	Wastewater Reuse Technology Pilot, South Miami-Dade Reuse ¹	217	0	1	30
38	Acme Basin B ²	0	0	0	6,528
39	Strazzula Wetlands ¹	0	0	0	485
43	Bird Drive Recharge Area ¹	107	0	0	400
45	Broward County Water Preserve Area (WPA) ¹	0	0	0	2,713
46	C-4 Structure ¹	1,980	0	0	219
47	WCA-3A/3B Flows to Central Lake Belt ²	0	0	0	4,791
48	WCA-2B Flows to Everglades National Park ²	0	0	0	4,791
49	WPA Conveyance ¹	0	0	0	21
90	Miccosukee Water Management Plan ¹	12,439	0	0	33,086
91	Winsberg Farm Wetland Restoration ¹	0	1	1	148
92	Restoration of Pineland and Hardwood Hammocks in C-111 ¹	1	0	0	8
93	Henderson Creek / Belle Meade Restoration ¹	30,234	0	0	6,213
94	Lakes Park Restoration ¹	0	0	135	40
96	Seminole Tribe Big Cypress Water Conservation Plan ¹	1,740	50	0	18,693
	TOTAL acres of potential habitat identified	220,761	327,241	545,899	1,567,028

Table FWC-4 (cont.). Initial analysis of potential habitat acres for state-listed species in Comprehensive Everglades Restoration Project (CERP) project footprints¹ or study areas², based on literature review of habitat preferences, species' distributions, the FWC 2003 Draft landcover map, and best professional knowledge. Does not include species that are also federally listed.

WBS	Project Name	Florida tree snail	Gopher frog	Gopher tortoise	Key silver-side
1	Lake Okeechobee Watershed Project ²	0	178,876	709,592	0
2	Lake Istopoga Regulation Schedule ²	0	110,117	158,595	0
3,32	Lake Okeechobee ASR and pilot ASR ²	0	38,711	97,898	0
4,5,6,33	C-43 Reservoir, ASR, Backpumping with Treatment ¹	0	1,099	1,154	0
7	Indian River Lagoon - South ¹	0	19,955	79,189	0
8	Everglades Agricultural Area Storage Reservoir - Phase 1 ¹	0	0	11,045	0
10	Big Cypress/L-28 Interceptor ¹	0	3,329	3,548	0
11	Flows to Northwest and Central WCA-3A ¹	0	0	538	0
12,13	WCA-3 Decomp & Sheet Flow Enhancement - Parts 1 & 2 ²	40	0	1,394	0
14	Loxahatchee NWR Internal Canal Structures ²	0	0	5,634	0
17,18	North Palm Beach County - Parts 1 & 2 ²	0	147,051	223,329	0
20,21	PBC Agricultural Reserve Reservoir - Parts 1 & 2 ¹	0	363	661	0
22,34,40	Hillsboro ASR, Site 1 Impoundment, ASR pilot ¹	0	0	1,448	0
23	Flow to Eastern WCA-3B ¹	0	0	4	0
24	Broward County Secondary Canals ²	4	7,775	30,149	0
25	North Lakebelt Storage Area ¹	0	1	2,489	0
26	Central Lakebelt Storage ¹	0	0	2,125	0
27,36	Everglades NP & L-31N Seepage Management projects ²	40	0	2,918	0
28	Biscayne Bay Coastal Wetlands ²	125	0	8,983	98
29	C-111 Spreader Canal ²	48	0	1,328	4,070
30	Southern Golden Gate Estates Hydrologic Restoration ¹	0	9,361	11,585	0
31	Florida Keys Tidal Restoration ²	358	0	73	1,805
35	Lake Belt Pilot Project ¹	0	0	99	0
37,98	Wastewater Reuse Technology Pilot, South Miami-Dade Reuse ¹	0	0	42	0
38	Acme Basin B ²	0	2,565	8,347	0
39	Strazzula Wetlands ¹	0	0	526	0
43	Bird Drive Recharge Area ¹	0	0	1,244	0
45	Broward County Water Preserve Area (WPA) ¹	0	0	3,343	0
46	C-4 Structure ¹	0	0	223	0
47	WCA-3A/3B Flows to Central Lake Belt ²	0	0	1,904	0
48	WCA-2B Flows to Everglades National Park ²	0	0	1,904	0
49	WPA Conveyance ¹	0	0	265	0
90	Miccosukee Water Management Plan ¹	0	0	6,473	0
91	Winsberg Farm Wetland Restoration ¹	0	116	139	0
92	Restoration of Pineland and Hardwood Hammocks in C-111 ¹	0	0	66	0
93	Henderson Creek / Belle Meade Restoration ¹	0	9,999	12,844	0
94	Lakes Park Restoration ¹	0	289	160	0
96	Seminole Tribe Big Cypress Water Conservation Plan ¹	0	8,927	19,693	0
	TOTAL acres of potential habitat identified	616	538,534	1,410,949	5,972

Table FWC-4 (cont.). Initial analysis of potential habitat acres for state-listed species in Comprehensive Everglades Restoration Project (CERP) project footprints¹ or study areas², based on literature review of habitat preferences, species' distributions, the FWC 2003 Draft landcover map, and best professional knowledge. Does not include species that are also federally listed.

WBS	Project Name	Least tern	Limpkin	Little blue heron	Man-grove rivulus
1	Lake Okeechobee Watershed Project ²	55,432	187,715	194,682	0
2	Lake Istopoga Regulation Schedule ²	74,080	74,931	85,448	0
3,32	Lake Okeechobee ASR and pilot ASR ²	17,754	103,567	31,605	0
4,5,6,33	C-43 Reservoir, ASR, Backpumping with Treatment ¹	0	118	131	0
7	Indian River Lagoon - South ¹	2,722	20,858	21,956	369
8	Everglades Agricultural Area Storage Reservoir - Phase 1 ¹	332	41,785	421	0
10	Big Cypress/L-28 Interceptor ¹	572	21,393	21,397	0
11	Flows to Northwest and Central WCA-3A ¹	163	5,296	5,296	0
12,13	WCA-3 Decomp & Sheet Flow Enhancement - Parts 1 & 2 ²	10,874	595,933	596,009	0
14	Loxahatchee NWR Internal Canal Structures ²	11,889	143,842	145,577	0
17,18	North Palm Beach County - Parts 1 & 2 ²	156,693	144,310	179,245	2,290
20,21	PBC Agricultural Reserve Reservoir - Parts 1 & 2 ¹	332	228	394	0
22,34,40	Hillsboro ASR, Site 1 Impoundment, ASR pilot ¹	73	107	130	0
23	Flow to Eastern WCA-3B ¹	24	2,000	2,000	0
24	Broward County Secondary Canals ²	100,642	14,251	33,774	0
25	North Lakebelt Storage Area ¹	2,419	1,507	1,622	0
26	Central Lakebelt Storage ¹	2,392	2,912	2,953	0
27,36	Everglades NP & L-31N Seepage Management projects ²	2,827	7,234	8,093	0
28	Biscayne Bay Coastal Wetlands ²	8,364	26,063	30,654	8,875
29	C-111 Spreader Canal ²	27,206	56,501	70,119	21,013
30	Southern Golden Gate Estates Hydrologic Restoration ¹	1,760	42,168	42,636	73
31	Florida Keys Tidal Restoration ²	2,327	0	1,914	751
35	Lake Belt Pilot Project ¹	16	32	37	0
37,98	Wastewater Reuse Technology Pilot, South Miami-Dade Reuse ¹	260	56	79	0
38	Acme Basin B ²	14,287	1,868	7,663	0
39	Strazzula Wetlands ¹	65	2,841	2,882	0
43	Bird Drive Recharge Area ¹	51	2,549	2,562	0
45	Broward County Water Preserve Area (WPA) ¹	580	5,050	5,166	0
46	C-4 Structure ¹	2,022	64	270	0
47	WCA-3A/3B Flows to Central Lake Belt ²	1,803	16,367	16,915	0
48	WCA-2B Flows to Everglades National Park ²	1,803	16,367	16,915	0
49	WPA Conveyance ¹	2	223	223	0
90	Miccosukee Water Management Plan ¹	668	74,903	74,903	0
91	Winsberg Farm Wetland Restoration ¹	46	2	26	0
92	Restoration of Pineland and Hardwood Hammocks in C-111 ¹	1	0	0	0
93	Henderson Creek / Belle Meade Restoration ¹	466	23,813	23,886	0
94	Lakes Park Restoration ¹	239	174	183	0
96	Seminole Tribe Big Cypress Water Conservation Plan ¹	153	29,578	29,667	0
	TOTAL acres of potential habitat identified	501,340	1,666,607	1,657,432	33,369

Table FWC-4 (cont.). Initial analysis of potential habitat acres for state-listed species in Comprehensive Everglades Restoration Project (CERP) project footprints¹ or study areas², based on literature review of habitat preferences, species' distributions, the FWC 2003 Draft landcover map, and best professional knowledge. Does not include species that are also federally listed.

WBS	Project Name	Miami black-headed snake	Osprey	Reddish egret	Roseate spoonbill
1	Lake Okeechobee Watershed Project ²	0	0	0	110,940
2	Lake Istopoga Regulation Schedule ²	0	0	0	14,260
3,32	Lake Okeechobee ASR and pilot ASR ²	0	0	0	13,223
4,5,6,33	C-43 Reservoir, ASR, Backpumping with Treatment ¹	0	0	0	65
7	Indian River Lagoon - South ¹	0	0	1,367	9,866
8	Everglades Agricultural Area Storage Reservoir - Phase 1 ¹	0	0	0	205
10	Big Cypress/L-28 Interceptor ¹	0	0	0	6,586
11	Flows to Northwest and Central WCA-3A ¹	0	0	0	4,585
12,13	WCA-3 Decomp & Sheet Flow Enhancement - Parts 1 & 2 ²	0	0	0	575,334
14	Loxahatchee NWR Internal Canal Structures ²	0	0	0	135,054
17,18	North Palm Beach County - Parts 1 & 2 ²	0	0	32,784	79,887
20,21	PBC Agricultural Reserve Reservoir - Parts 1 & 2 ¹	0	0	0	72
22,34,40	Hillsboro ASR, Site 1 Impoundment, ASR pilot ¹	0	0	0	36
23	Flow to Eastern WCA-3B ¹	0	0	0	1,941
24	Broward County Secondary Canals ²	0	0	0	5,613
25	North Lakebelt Storage Area ¹	0	0	0	355
26	Central Lakebelt Storage ¹	0	0	0	1,227
27,36	Everglades NP & L-31N Seepage Management projects ²	1,002	0	0	6,362
28	Biscayne Bay Coastal Wetlands ²	1,890	0	10,734	27,783
29	C-111 Spreader Canal ²	427	4,070	34,154	64,620
30	Southern Golden Gate Estates Hydrologic Restoration ¹	0	0	0	8,876
31	Florida Keys Tidal Restoration ²	0	1,805	1,863	751
35	Lake Belt Pilot Project ¹	0	0	0	32
37,98	Wastewater Reuse Technology Pilot, South Miami-Dade Reuse ¹	23	0	48	8
38	Acme Basin B ²	0	0	0	982
39	Strazzula Wetlands ¹	0	0	0	1,303
43	Bird Drive Recharge Area ¹	47	0	0	2,497
45	Broward County Water Preserve Area (WPA) ¹	0	0	0	4,665
46	C-4 Structure ¹	210	0	0	16
47	WCA-3A/3B Flows to Central Lake Belt ²	0	0	0	15,641
48	WCA-2B Flows to Everglades National Park ²	0	0	0	15,641
49	WPA Conveyance ¹	0	0	0	148
90	Miccosukee Water Management Plan ¹	0	0	0	63,014
91	Winsberg Farm Wetland Restoration ¹	0	0	0	1
92	Restoration of Pineland and Hardwood Hammocks in C-111 ¹	0	0	0	0
93	Henderson Creek / Belle Meade Restoration ¹	0	0	49	3,554
94	Lakes Park Restoration ¹	0	0	147	20
96	Seminole Tribe Big Cypress Water Conservation Plan ¹	0	0	0	10,383
	TOTAL acres of potential habitat identified	3,599	5,874	81,146	1,185,547

Table FWC-4 (cont.). Initial analysis of potential habitat acres for state-listed species in Comprehensive Everglades Restoration Project (CERP) project footprints¹ or study areas², based on literature review of habitat preferences, species' distributions, the FWC 2003 Draft landcover map, and best professional knowledge. Does not include species that are also federally listed.

WBS	Project Name	Sherman's fox squirrel	Sherman's short- tailed shrew	Short- tailed snake	Snowy egret
1	Lake Okeechobee Watershed Project ²	254,610	0	64,363	194,682
2	Lake Istopoga Regulation Schedule ²	86,455	0	68,566	85,448
3,32	Lake Okeechobee ASR and pilot ASR ²	31,502	0	0	31,605
4,5,6,33	C-43 Reservoir, ASR, Backpumping with Treatment ¹	96	0	0	131
7	Indian River Lagoon - South ¹	26,967	0	0	21,956
8	Everglades Agricultural Area Storage Reservoir - Phase 1 ¹	0	0	0	421
10	Big Cypress/L-28 Interceptor ¹	0	0	0	21,397
11	Flows to Northwest and Central WCA-3A ¹	0	0	0	5,296
12,13	WCA-3 Decomp & Sheet Flow Enhancement - Parts 1 & 2 ²	0	0	0	596,009
14	Loxahatchee NWR Internal Canal Structures ²	0	0	0	145,577
17,18	North Palm Beach County - Parts 1 & 2 ²	180,533	0	0	179,245
20,21	PBC Agricultural Reserve Reservoir - Parts 1 & 2 ¹	240	0	0	394
22,34,40	Hillsboro ASR, Site 1 Impoundment, ASR pilot ¹	0	0	0	130
23	Flow to Eastern WCA-3B ¹	0	0	0	2,000
24	Broward County Secondary Canals ²	0	0	0	33,774
25	North Lakebelt Storage Area ¹	0	0	0	1,622
26	Central Lakebelt Storage ¹	0	0	0	2,953
27,36	Everglades NP & L-31N Seepage Management projects ²	0	0	0	8,093
28	Biscayne Bay Coastal Wetlands ²	0	0	0	31,689
29	C-111 Spreader Canal ²	0	0	0	74,258
30	Southern Golden Gate Estates Hydrologic Restoration ¹	0	0	0	42,636
31	Florida Keys Tidal Restoration ²	0	0	0	1,914
35	Lake Belt Pilot Project ¹	0	0	0	37
37,98	Wastewater Reuse Technology Pilot, South Miami-Dade Reuse ¹	0	0	0	79
38	Acme Basin B ²	0	0	0	7,663
39	Strazzula Wetlands ¹	0	0	0	2,882
43	Bird Drive Recharge Area ¹	0	0	0	2,562
45	Broward County Water Preserve Area (WPA) ¹	0	0	0	5,166
46	C-4 Structure ¹	0	0	0	270
47	WCA-3A/3B Flows to Central Lake Belt ²	0	0	0	16,915
48	WCA-2B Flows to Everglades National Park ²	0	0	0	16,915
49	WPA Conveyance ¹	0	0	0	223
90	Miccosukee Water Management Plan ¹	0	0	0	74,903
91	Winsberg Farm Wetland Restoration ¹	25	0	0	26
92	Restoration of Pineland and Hardwood Hammocks in C-111 ¹	0	0	0	0
93	Henderson Creek / Belle Meade Restoration ¹	0	0	0	23,886
94	Lakes Park Restoration ¹	144	9	0	183
96	Seminole Tribe Big Cypress Water Conservation Plan ¹	0	0	0	29,667
	TOTAL acres of potential habitat identified	580,572	9	132,929	1,662,606

Table FWC-4 (cont.). Initial analysis of potential habitat acres for state-listed species in Comprehensive Everglades Restoration Project (CERP) project footprints¹ or study areas², based on literature review of habitat preferences, species' distributions, the FWC 2003 Draft landcover map, and best professional knowledge. Does not include species that are also federally listed.

WBS	Project Name	South-eastern American kestrel	South-eastern snowy plover	Tricolored heron	White ibis	White-crowned pigeon
1	Lake Okeechobee Watershed Project ²	617,850	0	194,682	194,682	0
2	Lake Istopoga Regulation Schedule ²	118,789	0	85,448	85,448	0
3,32	Lake Okeechobee ASR and pilot ASR ²	62,329	0	31,605	31,605	0
4,5,6,33	C-43 Reservoir, ASR, Backpumping with Treatment ¹	81	0	131	131	0
7	Indian River Lagoon - South ¹	71,304	0	21,956	21,956	0
8	Everglades Agricultural Area Storage Reservoir - Phase 1 ¹	0	0	421	421	0
10	Big Cypress/L-28 Interceptor ¹	0	0	21,397	21,397	0
11	Flows to Northwest and Central WCA-3A ¹	0	0	5,296	5,296	0
12,13	WCA-3 Decomp & Sheet Flow Enhancement - Parts 1 & 2 ²	0	0	596,009	596,009	40
14	Loxahatchee NWR Internal Canal Structures ²	0	0	145,577	145,577	0
17,18	North Palm Beach County - Parts 1 & 2 ²	156,403	0	179,245	179,245	0
20,21	PBC Agricultural Reserve Reservoir - Parts 1 & 2 ¹	75	0	394	394	0
22,34,40	Hillsboro ASR, Site 1 Impoundment, ASR pilot ¹	0	0	130	130	0
23	Flow to Eastern WCA-3B ¹	0	0	2,000	2,000	0
24	Broward County Secondary Canals ²	0	0	33,774	33,774	0
25	North Lakebelt Storage Area ¹	0	0	1,622	1,622	0
26	Central Lakebelt Storage ¹	0	0	2,953	2,953	0
27,36	Everglades NP & L-31N Seepage Management projects ²	0	0	8,093	8,093	40
28	Biscayne Bay Coastal Wetlands ²	0	0	31,689	31,689	5,296
29	C-111 Spreader Canal ²	0	0	74,258	74,258	7,528
30	Southern Golden Gate Estates Hydrologic Restoration ¹	0	0	42,636	42,636	0
31	Florida Keys Tidal Restoration ²	0	0	1,914	1,914	1,050
35	Lake Belt Pilot Project ¹	0	0	37	37	0
37,98	Wastewater Reuse Technology, South Miami-Dade Reuse ¹	0	0	79	79	0
38	Acme Basin B ²	0	0	7,663	7,663	0
39	Strazzula Wetlands ¹	0	0	2,882	2,882	0
43	Bird Drive Recharge Area ¹	0	0	2,562	2,562	0
45	Broward County Water Preserve Area (WPA) ¹	0	0	5,166	5,166	2
46	C-4 Structure ¹	0	0	270	270	0
47	WCA-3A/3B Flows to Central Lake Belt ²	0	0	16,915	16,915	0
48	WCA-2B Flows to Everglades National Park ²	0	0	16,915	16,915	0
49	WPA Conveyance ¹	0	0	223	223	0
90	Miccosukee Water Management Plan ¹	0	0	74,903	74,903	0
91	Winsberg Farm Wetland Restoration ¹	1	0	26	26	0
92	Restoration of Pineland, Hardwood Hammocks in C-111 ¹	0	0	0	0	0
93	Henderson Creek / Belle Meade Restoration ¹	0	0	23,886	23,886	0
94	Lakes Park Restoration ¹	135	0	183	183	0
96	Seminole Tribe Big Cypress Water Conservation Plan ¹	0	0	29,667	29,667	0
	TOTAL acres of potential habitat identified	1,026,968	0	1,662,606	1,662,606	13,957

Strategic Habitat Conservation Areas

In a 1994 publication, Cox et al. of the FWC Office of Environmental Services in Tallahassee, delineated areas not in public ownership that have been identified as important for the long-term viability of select species and species groups. Areas were delineated using Geographic Information System (GIS) methods, based on digitized maps of statewide landcover, known occurrences of species, public and private lands devoted to some extent to conservation, soils, statewide roads, and county boundaries. The lands identified as SHCAs are essential to providing species with the land base necessary to sustain populations into the future. These areas should be conserved and managed for their resident flora and fauna. For the purposes of the current evaluation, project footprints and study areas were overlaid onto maps of SHCAs, and the acreages of SHCAs were calculated for each project using the “Summarize Areas” feature in ArcView 3.2 Spatial Analyst (Table FWC-5).

Table FWC-5. Acres of FWC designated Strategic Habitat Conservation Areas (Cox et al. 1994) occurring within Comprehensive Everglades Restoration Plan (CERP) project footprints.

WBS	CERP Project Name	Big Cypress fox squirrel	Florida black bear	Florida sandhill crane	Limpkin	South-eastern American kestrel	White-crowned pigeon	Wading birds
1	Lake Okeechobee Watershed Project	0	0	27,107	0	3,870	0	18,864
2	Lake Istopoga Regulation Schedule	0	0	0	0	825	0	6,000
3, 32	Lake Okeechobee ASR and pilot ASR	0	0	339	0	0	0	0
4,5,6,33	C-43 Reservoir, ASR, and backpumping with treatment	10	0	0	0	0	0	0
7	Indian River Lagoon - South	0	0	11,567	0	0	0	7,663
8	Everglades Agricultural Area Reservoir - Part 1	0	0	0	0	0	0	0
10	Big Cypress / L-28 Interceptor	0	19,996	0	0	0	0	0
11	Flows to Northwest/Central WCA-3A	0	0	0	0	0	0	0
12,13	WCA-3 Decomp & Sheet Flow Enhancement - Parts 1 & 2	0	44	0	0	0	0	1,433
14	Loxahatchee NWR Internal Canal Structures	0	0	0	0	0	0	104
17,18	North Palm Beach County - Parts 1 & 2	0	0	14,421	8,592	0	0	3,373
20,21	PBC Agricultural Reserve Reservoir - Parts 1 & 2	0	0	0	0	0	0	0
22,34,40	Hillsboro ASR pilot, ASR, and Site 1 Impoundment	0	0	0	0	0	0	0
23	Flow to Eastern WCA-3B	0	0	0	0	0	0	0
24	Broward County Secondary Canals	0	0	0	0	0	0	1,475
25	North Lakebelt Storage Area	0	0	0	0	0	0	0
26	Central Lakebelt Storage	0	0	0	0	0	0	507
27,36	Everglades NP & L-31N seepage management projects	0	0	0	0	0	0	0
28	Biscayne Bay Coastal Wetlands	0	0	0	0	0	0	7
29	C-111 Spreader Canal	0	0	0	0	0	0	12
30	Southern Golden Gate Estates Hydrologic Restoration	0	43,451	0	0	0	0	2,385
31	Florida Keys Tidal Restoration	0	0	0	0	0	148	0
35	Lake Belt Pilot Project	0	0	0	0	0	0	0
37,97,98	Wastewater Reuse Technology Pilot & Miami-Dade	0	0	0	0	0	0	0
38	Acme Basin B	0	0	0	0	0	0	0
39	Strazzula Wetlands	0	0	0	0	0	0	961
43	Bird Drive Recharge Area	0	0	0	0	0	0	0
45	Broward County Water Preserve Area (WPA)	0	0	0	0	0	0	2,217
46	C-4 Structure	0	0	0	0	0	0	0
47	WCA-3A/3B Flows to Central Lake Belt	0	0	0	0	0	0	2,483
48	WCA-2B Flows to Everglades National Park	0	0	0	0	0	0	2,483
49	WPA Conveyance	0	0	0	0	0	0	30
90	Miccosukee Water Management Plan	0	40	0	0	0	0	0
91	Winsberg Farm Wetland Restoration	0	0	0	0	0	0	0
92	Restoration of Pineland & Hardwood Hammocks in C-111	0	0	0	0	0	0	0
93	Henderson Creek / Belle Meade Restoration	0	0	0	0	0	0	6,689
94	Lakes Park Restoration	0	0	0	0	0	0	0
96	Seminole Tribe Big Cypress Reservation Water Cons.	0	25,424	0	0	0	0	0
	Total acres for all CERP projects	10	88,955	53,433	8,592	4,695	148	56,685

Discussion of Species-Habitat Assemblage Groups

Marsh, swamp, and wetland shrub complex of species

Colonial wading birds

Several of Florida's state-listed species are wading birds, which may be susceptible to abnormal disturbance during their nesting periods. This group includes the little blue heron, tricolored heron, snowy egret, white ibis, and roseate spoonbill. The state-listed colonial wading birds use nesting and foraging habitat similar to that of the federally-listed wood stork. Freshwater and estuarine habitats that contain tree islands and normally remain flooded through the dry season are preferred nesting areas. For known colony sites containing listed species and relative abundance information, please refer to the FWC publication *Florida Atlas of Breeding Sites for Herons and their Allies, Update 1999* or to the following website link:

<http://www.wildflorida.org/waders/>. This database contains records for known and verified colonies in the state of Florida that were surveyed by the FWC during the 1999 nesting season. Breeding sites discovered more recently than this are not included in the database. This information is normally updated at approximately 10-year intervals, so the subsequent atlas inventory, which is scheduled for 2009, should be consulted when it becomes available. Those CERP projects with wading bird colonies known to occur within their project area boundaries include the WCA-3 Decompartmentalization & Sheet Flow Enhancement Parts 1 and 2, North Palm Beach County Part 1, Indian River Lagoon South, Lake Okeechobee Aquifer Storage and Recovery (ASR), Lake Okeechobee Watershed, and Loxahatchee National Wildlife Refuge Internal Canal Structures. Although the atlas wading bird data should be useful for planning purposes, one should be aware that colony activity, species composition, and detectability may vary from one year to another. Another source of information that has been available in recent years, and that should also be consulted, is the South Florida Wading Bird Report, which is a District compilation of colony data from various sources encompassing much of South Florida.

The FWC has identified several SHCAs for maintenance of wading bird populations in the CERP project areas. Some of the important projects with lands identified in these SHCAs include the Lake Okeechobee Watershed, Indian River Lagoon South, Henderson Creek/Belle Meade Restoration, and North Palm Beach County projects. Since the primary objective of most of these projects is the restoration of historic wetlands, state-listed wading birds should benefit from additional or improved foraging habitat. However, CERP projects involving construction activity occurring in or adjacent to long hydroperiod marsh areas could potentially disrupt wading bird nesting activity. Projects with this potential include, but are not necessarily limited to, WCA-3 Decomp & Sheet Flow Enhancement Parts 1 and 2, Big Cypress/L-28 Interceptor Modifications, Loxahatchee National Wildlife Refuge Internal Canal Structures, Flow to Eastern Water Conservation Area 3B, Everglades National Park Seepage Management, Lake Okeechobee ASR, and WCA-2B Flows to Everglades National Park.

As hydro patterns in some wetland areas change due to current and future restoration and other water-related projects, wading bird rookery sites are likely to shift as well. Consequently, on-the-ground field surveys should be conducted in any potential nesting areas where heavy construction or other intrusive human activities are anticipated to occur during the nesting season. Human activities that elicit a repeated flushing response of nesting wading birds from their nests leave the eggs or young susceptible to avian predation and/or adverse weather conditions. The FWC has developed a general recommended setback distance around wading bird colonies of 330 feet (100 meters) to prevent human disturbance of nesting sites (Rodgers and Smith 1995). Any heavy construction or other abnormal human-related activities that would be expected to occur within approximately 100 meters of a known rookery location should be conducted outside of the wading bird nesting season, which normally extends from early February to the onset of the rainy season. In the event that disturbance during the nesting season is unavoidable, the FWC should be contacted to help determine the best strategy for minimizing disturbance.

Another potential project impact would be the removal of native woody vegetation used by protected species of wading birds for nesting. Tree islands are scarce and valuable habitats, and their loss could have a long-term impact on regional wading bird nesting success. We recommend that, whenever possible, measures be taken to avoid such impacts, and opportunities for increasing suitable nesting sites should be explored. For example, project components that involve the removal of internal levees could include designs that involve the creation of low elevation islands that could serve as potential rookery sites. In locations where canal back-filling may occur, the creation of wet prairie or slough habitat may augment existing foraging opportunities for listed wading bird species. Furthermore, the effects of reservoirs and stormwater treatment areas on listed species of wading birds could be either positive or negative, depending on the siting, design, and operation of these features. When the inclusion of design features favoring shallow water depths for foraging and low elevation islands for nesting do not compromise the primary purpose of these project features, they should be incorporated into project plans.

Other protected wetland species

The threatened Everglades mink is known from shallow wetland habitats in the Big Cypress Swamp and the Everglades with the current distribution limited to the southern portions of Dade and Collier counties, and to northeastern Monroe County. This secretive species has been recorded from roadside berms, levees, areas adjacent to canals, and tree islands in the Everglades, but appears to prefer the more forested habitats of the Big Cypress Swamp. Dens of the Everglades mink have been discovered in a hollow cypress stump and under an abandoned car, but may also be located in other suitable areas offering shelter. The limited reproductive data suggest that nursing young would be present in dens during March and April (Smith 1980), when water levels are relatively low. Surveys should be conducted, preferably during the mating season (September to November), to determine whether the species is present prior to commencement of construction activities. Projects involving removal or modifications to levees or roadways traversing wetlands, and impoundment construction could potentially affect this

species. Projects where levee modifications or impoundments are anticipated to occur include, but are not limited to, WCA-3 Decomp & Sheet Flow Enhancement Part 1 and 2, Big Cypress/L-28 Interceptor Modifications, Flow to Eastern Water Conservation Area 3B, Central Lake Belt Storage Area, Everglades National Park Seepage Management, C-111 Spreader Canal, L-31 N Seepage Management Pilot, and the Water Preserve Areas Conveyance project.

The limpkin, a species of special concern, occurs in wetland habitats with hydroperiod lengths capable of sustaining apple snails, its primary prey. Unlike the previously mentioned wading bird species, the limpkin is a solitary nester that may place its nest in a variety of sites including dense stands of marsh grasses, on piles of aquatic vegetation, in vine-covered shrubs, in the tops of sabal palms, and on high cypress branches (Rodgers et al. [eds.] 1996). Limpkins may initiate nesting in mid-January and commonly lay second clutches which would extend the nesting period into early June; however, breeding may occur as late as October. One of the gaps identified in Florida's wildlife habitat conservation system was approximately 8,600 acres of potential limpkin habitat southeast of J.W. Corbett Wildlife Management Area around Loxahatchee Slough, within the study area of the North Palm Beach County - Part 1 project. Those CERP restoration projects that increase the spatial extent of wetlands and improve the timing and distribution of water deliveries should benefit the limpkin. However, potential impacts to limpkins could occur through disturbance to marsh habitats during the nesting season. If marsh disturbance activities are conducted outside of the core nesting period (February through May), impacts to nests could be minimized. In the event that disturbance during the nesting season is unavoidable, surveys by a qualified biologist should be conducted to determine if nesting birds are present. If active nests are encountered, the FWC should be contacted to help determine the best strategy for minimizing disturbance.

The primary habitats used by the threatened Florida sandhill crane are pastures/prairies and emergent marshy wetlands dominated by pickerelweed and maidencane (Rodgers et al. [eds.] 1996). The transition zone between wetland and upland habitats is the most preferred habitat. The siting of project features such as reservoirs and aquifer storage and recovery (ASR) wells should attempt to minimize the inclusion of these important marshy wetlands within their footprints. The nests of sandhill cranes are built of aquatic vegetation and located over water within wetlands. Sandhill cranes may initiate nesting as early as January and continue into June. Any construction-related activities or other persistent disturbance activities that are to be conducted in suitable crane nesting habitat should be conducted outside the nesting season. If it is necessary to do such work during the nesting season, surveys should be conducted to determine whether cranes or their nests are present. Those CERP projects located in SHCAs for the sandhill crane include the Indian River Lagoon South, Lake Okeechobee Watershed, North Palm Beach County, and Lake Okeechobee ASR projects. The Indian River Lagoon - South project features include 11,567 acres designated as SHCAs. If these areas are restored, as proposed by preliminary project plans, the project should aid in closing one of the gaps in the sandhill crane's conservation needs. For more information on the Florida sandhill crane, one can refer to the FWC publication entitled "Ecology of the Florida Sandhill Crane" (Stys 1997).

Xeric upland complex of species

There is a suite of state-listed species which prefer xeric upland scrub and sandhill communities, and to a lesser extent may occupy upland forest communities. This guild of habitat associates includes the gopher frog, gopher tortoise, Florida pine snake, Florida burrowing owl, Florida mouse, and Sherman's fox squirrel, all listed as species of special concern, and the short-tailed snake, southeastern American kestrel, and federally-listed Florida scrub-jay, all listed as threatened by the FWC. The best strategy for reducing potential impacts to these state-listed species would be to avoid the construction of project features in areas that would displace or negatively affect their natural xeric habitats. These scrub/sandhill vegetative communities are located primarily on the Lake Wales Ridge, which has its southern terminus northwest of Lake Okeechobee, and on the Atlantic Ridge of Florida's east coast. An initial examination of the CERP project footprints suggests that only a few of them potentially contain scrub/sandhill ecological communities. The only project that would appear to have the potential for affecting state-listed xeric dependent wildlife species in the Lake Wales Ridge area is the Lake Okeechobee Watershed project. Two of these listed species, the short-tailed snake and the pine snake, have current distributions that appear to be limited to suitable habitat on the Lake Wales Ridge. The very secretive fossorial short-tailed snake has been recorded from upland habitats in Highlands and Polk counties. Recent records for the pine snake exist in upland areas of Polk County and the species is likely present in adjoining suitable habitat in Highlands County, as well (<http://wildnet.fwc.state.fl.us/wildobs/default.htm>). Sherman's fox squirrel would most likely be encountered in upland forested habitats in those project areas north of Lake Okeechobee and the Caloosahatchee River, such as the Lake Okeechobee Watershed and Lake Okeechobee ASR projects. SHCAs for the southeastern American kestrel occur within the boundaries of the Lake Okeechobee Watershed and Lake Istopoga Regulation Schedule projects.

Projects that could have potential adverse impacts to this same suite of protected wildlife species on the Atlantic Coastal Ridge include the Indian River Lagoon - South and North Palm Beach County - Part 1, projects. Both of these projects occur in or near areas that have been identified by the FWC as Strategic Habitat Conservation Areas, and as such, are considered hot spots for rare species (Cox et al. 1994). These areas are in particular need of protection to meet the minimum conservation goals for Florida's declining wildlife species and rare plant and animal communities. If there is any potential for impacts to these rare ecological communities, thorough surveys should be conducted to determine the listed wildlife species present and their population densities.

There are two species in this upland-dependent group that have adapted to human-altered rural habitats. Both the Florida burrowing owl and the gopher tortoise are fossorial species that initially may go undetected by those unfamiliar with their characteristic burrows or habits. These species have managed to survive in areas that bear little resemblance to their original natural habitat. Burrowing owls are known to occupy canal banks, cattle pastures, road berms, airports, golf courses, and partially developed residential and industrial areas where expanses of mowed lawn and ruderal grassland are maintained (Hipes et al. 2001). Gopher tortoises will occupy

similar disturbed habitats, but are more tolerant of wooded areas, as long as an adequate number of clearings are present. The gopher tortoise is a keystone species in remaining upland scrub and sandhill habitats. Gopher tortoise burrows provide shelter for many of the other state-listed species in this habitat complex including the Florida mouse, gopher frog, Florida pine snake, and the federally-listed eastern indigo snake. Consequently, prior to detailed project planning and construction, surveys should be conducted in suitable upland habitats to further assess listed species impacts.

For more detailed information on burrowing owl nest protection guidelines and procedures, please refer to the FWC website: <http://wildflorida.org/permits/policy/buowguidelines.pdf>. For detailed information on available options to address the presence of gopher tortoises on lands to be impacted, refer to the FWC website: <http://wildflorida.org/permits/permits.html#gophertortoise>.

Upland and swamp complex of species

The species in this complex depend on forested habitats for shelter, food, and reproduction. The threatened Big Cypress fox squirrel occupies most forest types, but avoids the dense interiors of mixed hardwood/cypress strands. This species is endemic to southwest Florida, where its distribution is bounded by the Caloosahatchee River to the north and the Everglades to the east. The Big Cypress fox squirrel frequents pine flatwoods, cypress swamp, tropical hardwood forest, mangrove forest, and suburban habitats in native vegetation. Slash pine is an important food source, while cabbage palms and bromeliads appear to be important for shelter (Humphrey [ed.] 1992). Periodic fires are beneficial in helping to maintain the open vegetative structure preferred by the Big Cypress fox squirrel. The Henderson Creek/Belle Meade Restoration, C-43 Basin Reservoir, and other CERP projects with suitable forested habitats occurring within the geographic range of this fox squirrel should be surveyed for the species early in the project planning process. Project design features should minimize habitat loss where the species is found to occur.

The threatened Florida black bear is a species that requires large contiguous natural areas and ranges widely to access a wide variety of forested habitats. The female requires very dense cover in remote swamps or thickets for denning purposes, although hollow trees may also be used. Due to the wide-ranging habits of black bears, care should be taken to ensure that travel corridors between important natural areas are not disrupted by the placement of project features. Opportunities should also be explored that have the potential to improve linkages between natural areas or help divert bears away from dangerous highway crossings.

The threatened Florida mastiff bat (also known as Wagner's mastiff bat) is a rare, infrequently observed tropical species that is endemic to South Florida. Although this bat prefers to forage over forested areas, it is also known from certain localities in Miami, using the shingles of Spanish tile roofs as roosting sites (Hipes et al. 2001). This species also has been found to use tree cavities for roosting and raising young. Very little is actually known concerning the biology,

ecology, or distribution of this bat in South Florida. All known observations to date have been made relatively close to either the east or west coast (Punta Gorda vicinity). Coastal forest habitats that may be impacted should be surveyed for this species' presence using acoustic censusing techniques. The protection of mature trees containing cavities in coastal areas should be practiced to provide refuge for this species, and other cavity-dwelling species.

Coastal complex of species

This group includes two shorebird species, the threatened least tern and the black skimmer, a species of special concern. Both species forage over open bodies of water, including estuaries, lakes, borrow pits, and canals, where they capture small fishes from the water's surface. The nesting requirements for these species are also similar in that they are colonial and prefer relatively bare expanses of sand or gravel with sparse vegetative cover for their nests. Due to the loss of most natural nesting habitat in South Florida to development, these species have adapted to using spoil islands and gravel-covered roofs for nesting colonies in recent decades. Least terns may begin nesting in mid-March and will re-nest if initial attempts are unsuccessful, with most nesting ending by early July. Black skimmers may start nesting in mid-May with nesting activities terminating by the end of August. Black skimmers have nested successfully along bridge and causeway roadsides as well as on spoil islands, but rooftop colonies have usually failed (Rodgers et al. [eds.] 1996). Barren spoil islands or relatively large sandy or gravelly clearings that are within a reasonable distance from the coast, or other productive foraging habitat, should be examined for possible nesting activity. Other migratory birds such as black-necked stilts and royal terns may utilize these barren habitats as well.

Brown pelicans, reddish egrets, roseate spoonbills, and white-crowned pigeons nest almost exclusively on mangrove islands in coastal areas. The nesting distribution of the white-crowned pigeon extends from southern Biscayne Bay through Florida Bay to the Marquesas Keys. The Florida Keys Tidal Restoration is the only project located in a SHCA for the white-crowned pigeon. The project entitled "Restore Pineland/Tropical Hardwood Hammocks C-111 Basin" may actually benefit this species, assuming that important fruit-producing tropical hardwood tree species are included in the planting program. The nesting distribution of the brown pelican includes the Indian River Lagoon, the St. Lucie and Caloosahatchee estuaries, coastal islands off of Collier County, and Florida Bay. Although unusual, there is a freshwater nesting record reported near the southwestern shore of Lake Okeechobee. Only the C-111 Spreader Canal project includes estuarine habitat that may potentially be used for nesting by reddish egrets, although the egret may forage within the boundaries of other projects.

Recommendations

1. The information presented in this report represents an initial summary of potential impacts and benefits of CERP projects on state-listed species. As projects are further developed, their

potential effects will become clearer, and more detailed recommendations will be provided by FWC.

2. Field surveys should be conducted for listed species, prior to site selection and construction. The list of potentially occurring species within this report is intended as a guide in determining which species to target in field surveys.
3. The Corps and District should follow FWC's Habitat Protection and Management Guidelines during detailed project design, construction, and maintenance (see next page for a list of specific guidelines).
4. CERP project managers should consult with the FWC and the Service for further details on listed-species concerns, and means by which to avoid impacts and enhance habitat value.
5. As a general rule, CERP project managers should avoid siting non-natural project features, such as stormwater treatment areas, impoundments, water treatment facilities, or ASR injection wells, on wetlands or relatively undisturbed uplands.
6. Projects located in close proximity to wading bird rookeries should minimize disturbance by conducting construction activities outside of the nesting season.
7. As most CERP projects involve creation of artificial impoundments, stormwater treatment areas, canals, or other non-natural features, the FWC encourages enhancement of fish and wildlife habitat on-site. Suggestions for habitat enhancement include establishment of native vegetation and creation of tree islands, wet prairies, littoral zones, or other natural habitats. The extensive acreage of non-natural features proposed in CERP (35,600 acres of STAs, 181,300 acres of surface water storage reservoirs, and more than 11,000 acres of in-ground reservoirs), indicates that habitat enhancements in constructed features would provide a spatially extensive range of benefits to native fish and wildlife.
8. The creation of non-natural features associated with many CERP projects presents a potential for further fragmentation of habitats for wide-ranging species, such as the black bear and the federally endangered Florida panther. CERP project managers should therefore work to create and maintain wildlife corridors for wide-ranging species.
9. Wherever possible, the FWC encourages the conservation and restoration of uplands and wetlands as an alternative or supplement to constructed project features. Natural areas, both upland and wetland, fulfill a multitude of essential functions, including: water quality improvement, aquifer recharge, water retention (in the case of wetlands), habitat for native flora and fauna, uptake of greenhouse gases, and improved air quality. Finally, natural areas have recreational and aesthetic value, and do not contribute to the increase in pollutant loading and habitat fragmentation associated with development or highway expansion.

FWC Habitat Protection and Management Guidelines

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FWC Bureau of Protected Species Management. 2001. Standard Manatee Construction Conditions. <http://myfwc.com/psm/permit/construct.htm>.

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FWC Bureau of Wildlife Diversity Conservation. 2001. Osprey Nest Removal Policies. http://wildflorida.org/permits/policy/Osprey_policies.pdf

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Stys, B. 1993. Ecology and Habitat Protection Needs of the Southeastern American Kestrel (*Falco sparverius paulus*) on Large-scale Development Sites in Florida. Nongame Wildlife Technical Report No. 13. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida. 35 pp.

Stys, B. 1997. Ecology of the Florida sandhill crane. Nongame Wildlife Program Technical Report No. 15. Florida Fish And Wildlife Conservation Commission, Tallahassee, Florida. 20 pp.

Summary

Before reading the summary, readers should examine the methods section of this document for important assumptions that went in to the estimation of potential effects. The analysis was based on a reasonable worst case scenario given the often limited project information that was available and does not include a number of important benefits to listed species expected to result from other aspects of CERP implementation. Because most of the projects analyzed are in the early stages of planning, uncertainty is high and the actual effects of each project will likely be both different and smaller than those summarized here.

Table M-1 summarized potential occurrences for federally listed species including two mammal species, nine bird species, two reptile species and two reptile groups (skinks and sea turtles), three plant species and two plant groups (high pine-scrub and pine rockland), and designated critical habitat for four species (American crocodile, Cape Sable seaside sparrow, Everglade snail kite, and West Indian manatee) by CERP project. Table M-2 identified potential occurrences for seventeen MSRP ecological communities by CERP project. In order to provide a conservative analysis, we assumed that all suitable habitat was occupied by the pertinent listed species.

Table S-1, Table S-2 (Florida panthers), and Table S-3 (West Indian manatee) summarize initial analyses of potential effects of CERP projects on federally listed species and designated critical habitats that could be expressed in acres. Table S-4 summarizes initial analysis of amounts of MSRP ecological communities within CERP project footprints. It is important that readers keep in mind that not all potential effects are included in these Appendices or this prose summary. Effects such as construction disturbance, increased or decreased risk of vehicle collisions or improved habitat connectivity could not be expressed in acres and so are not included. Readers interested in all potential effects of a project should read the full project analysis. At this time, the 54 CERP project footprints analyzed in this report comprise between 1.9 and 2.0 million acres of the approximately 13 million acres within the CERP planning area.

Table S-1. Initial analysis of footprint effects (acres) to federally designated critical habitats and listed species by Comprehensive Everglades Restoration Plan (CERP) project.

WBS	CERP PROJECTS	Project footprint acres	American Crocodile			
			Critical Habitat		Suitable Habitat	
			adv	ben	adv	ben
1, 2	Lake Okeechobee Watershed and Lake Istokpoga Regulation Schedule (range of effects [low to high] for 1 & 2 combined)	34,375				
3	Lake Okeechobee Aquifer Storage & Recovery	100				
4,5,6,33	C-43 Storage Reservoir, ASR, & Backpumping w/ Stormwater	25,000				
7	Indian River Lagoon -South	118,820				
8,9	Everglades Agricultural Area Storage Reservoirs - Phase 1&2	60,000				
10	Big Cypress / L-28 Interceptor Modifications	2,201				
11	Flow to Northwest & Central Water Conservation Area 3A	11				
12	WCA-3 Decomp. & Sheet Flow Enhancement - Part 1	594,000				
13	WCA-3 Decomp. & Sheet Flow Enhancement - Part 2	594,000				
14	Loxahatchee National Wildlife Refuge Internal Canal Structures	negligible				
15	Modify Holey Land Wildlife Management Area Operation Plan	0				
16	Modify Rotenberger Wildlife Management Area Operation Plan	4,500				
17	North Palm Beach County - Part 1	400,000				
18	North Palm Beach County - Part 2	220				
20, 21	Palm Beach County Agriculture Reserve Reservoir and ASR	1,660				
22	Hillsboro Aquifer Storage & Recovery - Part 2	2,460				
23	Flow to Eastern Water Conservation Area	10				
24	Broward County Secondary Canal System	80				
25	North Lake Belt Storage Area	4,848				
26	Central Lake Belt Storage Area	3,680				
27	Everglades National Park Seepage Management	582				
28	Biscayne Bay Coastal Wetlands	46,000			117	205
29	C-111 Spreader Canal	3,965	529	236	529	236
30	Southern Golden Gate Estates Hydrologic Restoration*	60,160			0	0
31	Florida Keys Tidal Restoration	1			1	0
32	Lake Okeechobee Aquifer Storage & Recovery Pilot	10				
34	Hillsboro Aquifer Storage & Recovery Pilot	5				
35	Lake Belt In-Ground Reservoir Technology Pilot	102				
36	L-31N Seepage Management Pilot	12				
37,97,98	Wastewater Reuse Technology Pilot	3			0	3
38	Acme Basin B Discharge (range of effects [low to high])	8 930				
39	Strazzulla Wetlands	3,384				
40	Hillsboro Site 1 Impoundment	900				
43	Bird Drive Recharge Area	3,815				
44	Aquifer Storage & Recovery Regional Study	0				
45	Broward County Water Preserve Areas	8,953				
46	C-4 Structure	negligible				
47	WCA 3A/3B Flows to Central Lake Belt (CLB)	negligible				
48	WCA 2B Flows to ENP	565				
49	WPA Conveyance	472				
90	Miccosukee Water Management Plan	937				
91	Winsberg Farm Wetland Restoration	175				
92	Restore Pineland/Tropical Hardwood Hammocks C-111 Basin	50				
93	Henderson Creek / Belle Meade Restoration				0	0
94	Lakes Park Restoration	40			0	0
95	Melaleuca Eradication and Other Exotic Plants	0				
	Total effect acres - low estimate	1,976,104	529	236	647	444
	Total effect acres - high estimate	1,977,026	529	236	647	444

Table S-1 (continued). Preliminary analysis of footprint effects (acres) to designated critical habitats and listed species by Comprehensive Everglades Restoration Plan (CERP) project.

WBS	CERP PROJECTS	Everglade Snail Kite				Audubon's	
		Critical Habitat		Suitable Habitat		Crested Caracara	
				adv	ben	adv	ben
1, 2	Lake Okeechobee Watershed and Lake Istokpoga Regulation Schedule (range of effects [low to high] for 1 & 2 combined)			0	3,531	29,415	0
				5,862	3,531	34,371	0
3	Lake Okeechobee Aquifer Storage & Recovery			16	0	100	0
4,5,6,3	C-43 Storage Reservoir, ASR, & Backpumping w/ Stormwater			6,615	0	25,000	0
7	Indian River Lagoon -South			256	54,211	19,668	75,050
8, 9	Everglades Agricultural Area Storage Reservoirs - Phase 1&2				64	0	0
10	Big Cypress / L-28 Interceptor Modifications			1,580	206		
11	Flow to Northwest & Central Water Conservation Area 3A	113	0	11	0		
12	WCA-3 Decomp. & Sheet Flow Enhancement - Part 1	1577	0	184	798		
13	WCA-3 Decomp. & Sheet Flow Enhancement - Part 2			741	1,682		
14	Loxahatchee National Wildlife Refuge Internal Canal Structures						
15	Modify Holey Land Wildlife Management Area Operation Plan						
16	Modify Rotenberger Wildlife Management Area Operation Plan						
17	North Palm Beach County - Part 1			1,561	0	3,300	0
18	North Palm Beach County - Part 2			0	0	200	0
20, 21	Palm Beach County Agriculture Reserve Reservoir and ASR			182	0		
22	Hillsboro Aquifer Storage & Recovery - Part 2						
23	Flow to Eastern Water Conservation Area			9	0		
24	Broward County Secondary Canal System						
25	North Lake Belt Storage Area			104	0		
26	Central Lake Belt Storage Area			1,190	0		
27	Everglades National Park Seepage Management			0	275		
28	Biscayne Bay Coastal Wetlands						
29	C-111 Spreader Canal			3,436	2,664		
30	Southern Golden Gate Estates Hydrologic Restoration*			0	962		
31	Florida Keys Tidal Restoration						
32	Lake Okeechobee Aquifer Storage & Recovery Pilot					0	0
34	Hillsboro Aquifer Storage & Recovery Pilot						
35	Lake Belt In-Ground Reservoir Technology Pilot						
36	L-31N Seepage Management Pilot						
37,38,	Wastewater Reuse Technology Pilot						
38	Acme Basin B Discharge (range of effects [low to high])						
39	Strazzulla Wetlands			62	3,336		
40	Hillsboro Site 1 Impoundment						
43	Bird Drive Recharge Area						
44	Aquifer Storage & Recovery Regional Study						
45	Broward County Water Preserve Areas			0	10		
46	C-4 Structure						
47	WCA 3A/3B Flows to Central Lake Belt (CLB)						
48	WCA 2B Flows to ENP			273	0		
49	WPA Conveyance						
90	Miccosukee Water Management Plan			0	4		
91	Winsberg Farm Wetland Restoration			0	140		
92	Restore Pineland/Tropical Hardwood Hammocks C-111 Basin						
93	Henderson Creek / Belle Meade Restoration						
94	Lakes Park Restoration						
95	Melaleuca Eradication and Other Exotic Plants						
	Total effect acres - low estimate	1,690	0	16,220	67,883	77,683	75,050
	Total effect acres - high estimate	1,690	0	22,082	67,883	82,639	75,050

Table S-1 (continued). Preliminary analysis of footprint effects (acres) to designated critical habitats and listed species by Comprehensive Everglades Restoration Plan (CERP) project.

WBS	CERP PROJECTS	Bald Eagle		Florida Grass-hopper sparrow		Florida Scrub-jay	
		adv	ben	adv	ben	adv	ben
1, 2	Lake Okeechobee Watershed and Lake Istokpoga Regulation Schedule (range of effects [low to high] for 1 & 2 combined)	23,012	3,500	20,171	0	23,293	0
		29,114	3,500	29,862	0	32,579	0
3	Lake Okeechobee Aquifer Storage & Recovery	0	0				
4,5,6,33	C-43 Storage Reservoir, ASR, & Backpumping w/ Stormwater	72	0	3,773	0	0	0
7	Indian River Lagoon -South		65,383			0	1,081
8 & 9	Everglades Agricultural Area Storage Reservoirs - Phase 1&2	0	0				
10	Big Cypress / L-28 Interceptor Modifications	0	0				
11	Flow to Northwest & Central Water Conservation Area 3A	0	0				
12	WCA-3 Decomp. & Sheet Flow Enhancement - Part 1						
13	WCA-3 Decomp. & Sheet Flow Enhancement - Part 2						
14	Loxahatchee National Wildlife Refuge Internal Canal Structures						
15	Modify Holey Land Wildlife Management Area Operation Plan						
16	Modify Rotenberger Wildlife Management Area Operation Plan						
17	North Palm Beach County - Part 1	3,100	0			0	0
18	North Palm Beach County - Part 2	200	0			0	0
20, 21	Palm Beach County Agriculture Reserve Reservoir and ASR	239	1,660				
22	Hillsboro Aquifer Storage & Recovery - Part 2	0	0				
23	Flow to Eastern Water Conservation Area	0	0				
24	Broward County Secondary Canal System	0	0				
25	North Lake Belt Storage Area	0	0				
26	Central Lake Belt Storage Area	0	0				
27	Everglades National Park Seepage Management	91	103				
28	Biscayne Bay Coastal Wetlands	496	169				
29	C-111 Spreader Canal	225	236				
30	Southern Golden Gate Estates Hydrologic Restoration*		3,960				
31	Florida Keys Tidal Restoration	0	0				
32	Lake Okeechobee Aquifer Storage & Recovery Pilot	0	0				
34	Hillsboro Aquifer Storage & Recovery Pilot						
35	Lake Belt In-Ground Reservoir Technology Pilot						
36	L-31N Seepage Management Pilot	0	0				
37,97,98	Wastewater Reuse Technology Pilot						
38	Acme Basin B Discharge (range of effects [low to high])						
39	Strazzulla Wetlands						
40	Hillsboro Site 1 Impoundment	1,680	0				
43	Bird Drive Recharge Area						
44	Aquifer Storage & Recovery Regional Study						
45	Broward County Water Preserve Areas	0	3,290				
46	C-4 Structure						
47	WCA 3A/3B Flows to Central Lake Belt (CLB)						
48	WCA 2B Flows to ENP						
49	WPA Conveyance						
90	Miccosukee Water Management Plan	0	0				
91	Winsberg Farm Wetland Restoration	0	140				
92	Restore Pineland/Tropical Hardwood Hammocks C-111 Basin						
93	Henderson Creek / Belle Meade Restoration	0	0				
94	Lakes Park Restoration	0	0				
95	Melaleuca Eradication and Other Exotic Plants						
	Total effect acres - low estimate	29,115	78,441	23,844	0	22,967	1,081
	Total effect acres - low estimate	35,217	78,441	33,635	0	32,579	1,081

Table S-1 (continued). Preliminary analysis of footprint effects (acres) to designated critical habitats and listed species by Comprehensive Everglades Restoration Plan (CERP) project.

WBS	CERP PROJECTS	Red-Cockaded Woodpecker		Wood Stork		Eastern Indigo Snake		Sea Turtles	
		adv	ben	adv	ben	adv	ben	adv	ben
1, 2	Lake Okeechobee Watershed and Lake Istokpoga Regulation Schedule (range of effects [low to high] for 1 & 2 combined)	4,315	0	23,293	3,656	33,666	13,657		
3	Lake Okeechobee Aquifer Storage & Recovery	8,425	0	34,371	3,656	41,208	13,657		
4,5,6,33	C-43 Storage Reservoir, ASR, & Backpumping w/			16	0	40	0		
7	Indian River Lagoon -South	363	0	18,229	0	25,000	79		
8, 9	Everglades Agricultural Area Storage Reservoirs - Phase 1&2	501	15,159	22,051	54,323	13,195	105,415	0	920
10	Big Cypress / L-28 Interceptor Modifications			60,000	0	60,000	1,058		
11	Flow to Northwest & Central Water Conservation Area 3A			2,145	146	2,083	154		
12	WCA-3 Decomp. & Sheet Flow Enhancement - Part 1			11	0	11	0		
13	WCA-3 Decomp. & Sheet Flow Enhancement - Part 2			287	798	282	0		
14	WCA-3 Decomp. & Sheet Flow Enhancement - Part 2			0	1,682	766	0		
15	Loxahatchee National Wildlife Refuge Internal Canal			0	0				
16	Modify Holey Land Wildlife Management Area Operation								
17	Modify Rotenberger Wildlife Management Area Operation								
18	North Palm Beach County - Part 1	875	0	3,200	0	1,216	0		
20, 21	North Palm Beach County - Part 2	200	0	200	0	200	0		
22	Palm Beach County Agriculture Reserve Reservoir and ASR			1,348	0	1,660	48		
23	Hillsboro Aquifer Storage & Recovery - Part 2			150	0	150	0		
24	Flow to Eastern Water Conservation Area			9	0	10	0		
25	Broward County Secondary Canal System			12	0	76	0		
26	North Lake Belt Storage Area			104	0	4,448	440		
27	Central Lake Belt Storage Area			1,190	0	3,680	374		
28	Everglades National Park Seepage Management			310	275	103	263		
29	Biscayne Bay Coastal Wetlands			2	5	2,146	1,898	0	0
30	C-111 Spreader Canal			3,436	2,664	236	5,864		
31	Southern Golden Gate Estates Hydrologic Restoration*	9,798	0	0	12,110	0	2,152	0	0
32	Florida Keys Tidal Restoration					1	0		
33	Lake Okeechobee Aquifer Storage & Recovery Pilot			0	0	10	0		
34	Hillsboro Aquifer Storage & Recovery Pilot					5	0		
35	Lake Belt In-Ground Reservoir Technology Pilot					102	43		
36	L-31N Seepage Management Pilot			0	0	12	0		
37,97,9	Wastewater Reuse Technology Pilot			3	0	0	3		
38	Acme Basin B Discharge (range of effects [low to high])			0	0	8	0		
39	Strazzulla Wetlands			375	0	379	17		
40	Hillsboro Site 1 Impoundment			62	3,336	62	3,384		
43	Bird Drive Recharge Area			1,336	5	1,705	8		
44	Aquifer Storage & Recovery Regional Study			1,579	697	1,448	23		
45	Broward County Water Preserve Areas								
46	C-4 Structure			2,695	0	3,622	35		
47	WCA 3A/3B Flows to Central Lake Belt (CLB)					0	0		
48	WCA 2B Flows to ENP					0	0		
49	WPA Conveyance			565	0	568	0		
90	WPA Conveyance			0	0	472	316		
91	Miccosukee Water Management Plan			937		937	30		
92	Winsberg Farm Wetland Restoration			10	140	165	10		
93	Restore Pineland/Tropical Hardwood Hammocks C-111					0	50		
94	Henderson Creek / Belle Meade Restoration			0	145	11	145		
95	Lakes Park Restoration			0	40	0	40		
95	Melaleuca Eradication and Other Exotic Plants								
	Total effect acres - low estimate	16,052	15,159	143,180	80,022	158,096	135,489	0	920
	Total effect acres - high estimate	20,162	15,159	154,633	80,022	166,009	135,506	0	920

Table S-1 (continued). Preliminary analysis of footprint effects (acres) to designated critical habitats and listed species by Comprehensive Everglades Restoration Plan (CERP) project.

WBS	CERP PROJECTS	Schaus Butterfly		Beautiful Pawpaw		High pine - Scrub Plants		Okeechobee Gourd	
		adv	ben	adv	ben	adv	ben	adv	ben
1, 2	Lake Okeechobee Watershed and Lake Istokpoga Regulation Schedule (range of effects [low to high] for 1 & 2 combined)					0	0	0	3,500
3	Lake Okeechobee Aquifer Storage & Recovery							100	0
4,5,6,33	C-43 Storage Reservoir, ASR, & Backpumping w/ Stormwater			72	0			0	0
7	Indian River Lagoon -South					0	1,081		
8 &9	Everglades Agricultural Area Storage Reservoirs - Phase 1&2							0	0
10	Big Cypress / L-28 Interceptor Modifications								
11	Flow to Northwest & Central Water Conservation Area 3A								
12	WCA-3 Decomp. & Sheet Flow Enhancement - Part 1							0	0
13	WCA-3 Decomp. & Sheet Flow Enhancement - Part 2								
14	Loxahatchee National Wildlife Refuge Internal Canal Structures								
15	Modify Holey Land Wildlife Management Area Operation Plan								
16	Modify Rotenberger Wildlife Management Area Operation Plan								
17	North Palm Beach County - Part 1								
18	North Palm Beach County - Part 2								
20, 21	Palm Beach County Agriculture Reserve Reservoir and ASR								
22	Hillsboro Aquifer Storage & Recovery - Part 2								
23	Flow to Eastern Water Conservation Area								
24	Broward County Secondary Canal System								
25	North Lake Belt Storage Area								
26	Central Lake Belt Storage Area								
27	Everglades National Park Seepage Management								
28	Biscayne Bay Coastal Wetlands	0	5						
29	C-111 Spreader Canal								
30	Southern Golden Gate Estates Hydrologic Restoration*								
31	Florida Keys Tidal Restoration								
32	Lake Okeechobee Aquifer Storage & Recovery Pilot							0	0
34	Hillsboro Aquifer Storage & Recovery Pilot								
35	Lake Belt In-Ground Reservoir Technology Pilot								
36	L-31N Seepage Management Pilot								
37,97,98	Wastewater Reuse Technology Pilot								
38	Acme Basin B Discharge (range of effects [low to high])								
39	Strazzulla Wetlands								
40	Hillsboro Site 1 Impoundment								
43	Bird Drive Recharge Area								
44	Aquifer Storage & Recovery Regional Study								
45	Broward County Water Preserve Areas								
46	C-4 Structure								
47	WCA 3A/3B Flows to Central Lake Belt (CLB)								
48	WCA 2B Flows to ENP								
49	WPA Conveyance								
90	Miccosukee Water Management Plan								
91	Winsberg Farm Wetland Restoration								
92	Restore Pineland/Tropical Hardwood Hammocks C-111 Basin								
93	Henderson Creek / Belle Meade Restoration								
94	Lakes Park Restoration								
95	Melaleuca Eradication and Other Exotic Plants								
	Total effect acres - low estimate	0	5	72	0	0	1,081	100	3,500
	Total effect acres - high estimate	0	5	72	0	0	1,081	1,343	3,500

American crocodile and designated critical habitat

American crocodiles or crocodile habitat may occur within the footprint of nine CERP projects. Three projects may adversely modify 647 acres of crocodile habitat and beneficially modify 444 acres of crocodile habitat. One project may adversely modify 529 acres and beneficially modify 236 acres of crocodile critical habitat. We expect that these adverse effects would likely be more than compensated for by the hydrologic benefits of CERP as salinities are substantially reduced in Florida Bay and adjacent estuarine areas, improving juvenile crocodile survival rates (Service 1999). An analysis of these potential hydrologic benefits will be presented in a future PAR for the ICU.

Audubon's crested caracara

Audubon's crested caracaras or caracara habitat may occur within the footprint of 13 CERP projects. Ten projects could potentially adversely modify between a low estimate of 77,683 acres to a high estimate of 82,639 acres and beneficially modify 75,050 acres of caracara habitat. This includes 6,817 acres of potential impact to an important Audubon's crested caracara juvenile congregation area. These impact numbers are part of a conservative analysis that counted some marginal caracara habitats, such as citrus groves, as potential habitat. In some cases, large areas of citrus were counted because information was not available to narrow down portions of citrus areas that were associated with suitable nesting habitat and would, therefore, be truly suitable foraging habitat. If PDTs narrow down siting options to avoid suitable habitats and conduct detailed surveys and analysis to better define suitable caracara habitats, we expect that the number of acres potentially adversely impacted would be significantly reduced and the overall CERP benefits to caracara could be shown to outweigh adverse impacts. The potential impact to a caracara juvenile congregation area is of particular concern. Placement of the C-43 Basin projects on the Duda property would impact up to 6,817 acres of an important Audubon's crested caracara juvenile congregation area. All of the potential benefits to caracara come from the natural storage area features of the Indian River Lagoon - South Project, underscoring the conservation importance of these features.

Bald eagle

Bald eagles or bald eagle habitat may occur within the footprint of 33 CERP projects. Seventeen projects could potentially adversely modify between a low estimate of 29,115 acres to a high estimate of 35,217 acres and beneficially modify 78,441 acres of bald eagle habitat. The Lake Okeechobee Watershed Project analysis accounts for the large majority of the potentially adversely affected acres. In this case, large areas were counted as potential bald eagle nesting habitat because detailed information on bald eagle nesting sites was not available. As this and other PDTs narrow down siting options and conduct detailed surveys for bald eagle nests, we expect that the number of acres potentially adversely impacted would be significantly reduced.

Cape Sable seaside sparrow and designated critical habitat

Cape Sable seaside sparrows and Cape Sable seaside sparrow critical habitat occur directly adjacent to the footprint of one CERP project and are not expected to be affected by project footprint. There will be significant hydrologic effects of CERP on the Cape Sable seaside sparrow and its habitat and these will be analyzed in a later PAR on the ICU.

Eastern indigo snake

Eastern indigo snakes or Eastern indigo snake habitat may occur within the footprint of 49 of the 54 CERP projects analyzed. These projects could potentially adversely modify between a low estimate of 158,096 acres to a high estimate of 166,009 acres and beneficially modify from a low estimate of 135,489 acres to a high estimate of 135,506 acres of Eastern indigo snake habitat. Although we expect these acreage estimates to be reduced as the CERP planning process proceeds, overall footprint adverse impacts would likely remain significantly higher than beneficial impacts. We do not expect that the hydrologic effects of CERP would be beneficial to this species that requires some upland habitat for suitable underground cover (Service 1999).

Everglade snail kite and designated critical habitat

Everglade snail kites or Everglade snail kite habitat may occur within the footprint of 29 CERP projects. Twenty-two of these projects may adversely modify between 16,220 and 22,082 acres of Everglade snail kite habitat and beneficially modify 67,883 acres of Everglade snail kite habitat. Two projects may adversely modify 1,690 acres of Everglade snail kite critical habitat. No projects were identified that may potentially benefit Everglade snail kite critical habitat. Significant additional beneficial effects resulting from CERP hydrologic changes are expected for this species.

Florida grasshopper sparrow

Potential Florida grasshopper sparrow habitat may occur within the footprint of six CERP projects. These 6 projects could potentially adversely modify between a low estimate of 23,884 acres to a high estimate of 33,635 acres. No projects that might provide beneficial habitat modifications were identified. No CERP project is expected to affect currently occupied habitat of this highly endangered species. However, potential habitat necessary for future recovery of this species is crucial to conservation efforts and the Service recommends that these areas be avoided if at all possible. Most of the potential impact was estimated for the Lake Okeechobee Watershed Project, where a very broad and conservative analysis was necessary due to highly uncertain siting information. This PDT has an opportunity to substantially reduce project impacts to potential Florida grasshopper sparrow habitat through careful siting and surveys to better define suitable habitats. Placement of the C-43 Basin projects on the Duda property would impact 3,715 acres of potential Florida grasshopper sparrow habitat.

Florida panther

The results of evaluating panther exposure to the siting of CERP project footprint features is summarized in Table S-2. Florida panther or Florida panther habitat may occur within the footprint of 26 CERP projects. Potential effects were calculated separately for the four panther zones (Figure 15). Sixteen CERP projects could affect habitat in the Primary/Dispersal Zone, six CERP projects could affect habitat in the Secondary Zone, six CERP projects could affect habitat in the Core, Other lands, and seven CERP projects could affect habitat in the Expansion Zone. The number of projects that could affect habitat in the various panther zones is not additive because some projects could affect habitat in more than one panther zone.

The sixteen CERP projects that occur in the Core, Primary/Dispersal Zone could potentially adversely modify a total of 7,451 acres and beneficially modify 68,623 acres of Florida panther habitat. Overall, the CERP could beneficially modify more acres than are adversely modified in the panther Primary/Dispersal Zone, with the majority of the potential beneficial effects resulting from restoration of high quality habitat in the Southern Golden Gate Estates project.

The six CERP projects that occur in the Core, Secondary Zone could potentially adversely modify a total of 28,968 acres and beneficially modify 246 acres of Florida panther habitat. Overall, the CERP could adversely modify more acres than are beneficially modified in the panther Secondary Zone, with the majority of potential adverse effects resulting from impacts to low quality habitat in the C-43 Basin Storage Reservoir project.

The six CERP projects that occur in the Core, Other lands could potentially adversely modify a total of 44,691 acres and beneficially modify 15,550 acres of Florida panther habitat. Overall, the CERP could adversely modify more acres than are beneficially modified in the panther Core, Other lands. The majority of Core, Other lands potentially adversely modified have low quality habitat value and are not currently used by panthers.

The seven CERP projects that occur in the Expansion Zone could potentially adversely modify a total of between a low estimate of 47,764 and 72,283 acres and beneficially modify 94,971 acres of Florida panther habitat. Overall, the CERP could beneficially affect the panther Expansion Zone, but this overall effect could be better balanced depending on the alternative selected for the Lake Okeechobee watershed projects.

This initial analysis indicates that 26 CERP projects could beneficially modify panther Primary/Dispersal and Expansion Zones and adversely modify the Secondary Zone and Core, Other lands. This initial analysis depends on final alternative selection for several key CERP projects including the Southern Golden Gates Hydrologic Restoration project, and water storage siting in the Indian River Lagoon - South project and Caloosahatchee and Lake Okeechobee watersheds. In addition to panther habitat value effects, the CERP will acquire land on which to site CERP features. This land acquisition will help achieve Everglades ecosystem restoration goals such as improving water quality, distribution, and timing and off-set negative effects of habitat value changes.

Table S-2. Initial analysis of effects to the Florida panther by Comprehensive Everglades Restoration Plan (CERP) project. Columns show acres of habitat that may be adversely (adv) or beneficially (ben) affected in four zones (Primary/Dispersal, Secondary, Expansion, and Other Lands) for habitats that have high, medium, and low quality value for panther breeding, feeding and sheltering.

	Panther Zone	Primary/Dispersal						Secondary					
	Habitat Quality	High		Med		Low		High		Med		Low	
WBS	CERP PROJECTS	adv	ben	adv	ben	adv	ben	adv	ben	adv	ben	adv	ben
1,2	Lake Okeechobee, Lake Istokpoga (combined) (first line low est., second line high est.)												
3	Lake Okeechobee Aquifer Storage & Recovery												
4,5,6,33	C-43 Basin Storage Reservoir - Part 1	10	0	1	0	776	0	2,015	0	46	0	26,907	0
7	Indian River Lagoon -South*												
8, 9	Everglades Agricultural Area Reservoirs												
10	Big Cypress/L-28 Interceptor Modifications	1,639	73	416	0								
11	Flow to Northwest & Central WCA-3A	5	0										
12	WCA-3 Decomp. & Sheet Flow Enhancement - P1	0	25					0	125				
13	WCA-3 Decomp. & Sheet Flow Enhancement - P2	0	292					0	139				
17	North Palm Beach County - Part 1												
20	Palm Beach County Ag Reserve Reservoir												
23	Flow to Eastern Water Conservation Area	10	0										
27	Everglades National Park Seepage Management	0	91										
28	Biscayne Bay Coastal Wetlands	22	0			120	0						
29	C-111 Spreader Canal	3,436	2,664										
30	Southern Golden Gate Estates Restoration ¹	67	65,428										
32	Lake Okeechobee ASR Pilot												
36	L-31N Seepage Management Pilot	12	0										
39	Strazzulla												
90	Miccosukee Water Management Plan			937	0								
92	Restore Pineland/Tropical Hardwoods in C-111 Basin	0	50										
	Total effect acres - low estimate	5,201	68,623	1,354	0	896	0	2,015	264	46	0	26,907	0
	Total effect acres - high estimate	5,201	68,623	1,354	0	896	0	2,015	264	46	0	26,907	0

¹ - In Southern Golden Gate Estates 2,153 acres of the 65,428 acres is new habitat created by removing roads. The balance is previously acquired high-quality habitat that will be improved.

Table S-2 (cont.). Initial analysis of effects to the Florida panther by Comprehensive Everglades Restoration Project (CERP) project. Columns show acres of habitat that may be adversely (adv) or beneficially (ben) affected in four zones (Primary/Dispersal, Secondary, Expansion, and Other Lands) for habitats that have high, medium, and low quality value for panther breeding, feeding and sheltering.

	Panther Zone	Expansion						Other Lands					
	Habitat Quality	High		Med		Low		High		Med		Low	
WBS	CERP PROJECTS	adv	ben	adv	ben	adv	ben	adv	ben	adv	ben	adv	ben
1,2	Lake Okeechobee, Lake Istokpoga (combined) (first line low est., second line high est.)	0	3,500	16,825	0	5,03	0						
		11,378	3,500	29,115	0	5,88	0						
3	Lake Okeechobee Aquifer Storage & Recovery					100	0						
4,5,6,33	C-43 Basin Storage Reservoir - Part 1	325	0	2,323	0	3,82	0						
7	Indian River Lagoon -South	783	91,471	337	0	18,2	0	0	3,91	0	0	0	8,496
8, 9	Everglades Agricultural Area Reservoirs ²							599	0	0	0	39,401	0
10	Big Cypress/L-28 Interceptor Modifications												
11	Flow to Northwest & Central WCA-3A												
12	WCA-3 Decomp. & Sheet Flow Enhancement - P1												
13	WCA-3 Decomp. & Sheet Flow Enhancement - P2												
17	North Palm Beach County - Part 1							2,977	0	0	0	1,072	0
20	Palm Beach County Ag Reserve Reservoir							73	0	3	3	566	0
23	Flow to Eastern Water Conservation Area												
27	Everglades National Park Seepage Management												
28	Biscayne Bay Coastal Wetlands												
29	C-111 Spreader Canal												
30	Southern Golden Gate Estates Restoration												
32	Lake Okeechobee ASR Pilot					10	0						
36	L-31N Seepage Management Pilot												
39	Strazzulla							0	3,12	3	4	0	14
90	Miccosukee Water Management Plan												
92	Restore Pineland/Tropical Hardwoods in C-111 Basin												
	Total effect acres - low estimate	1,108	94,971	19,485	0	27,1	0	3,649	7,03	3	4	41,039	8,510
	Total effect acres - high estimate	12,486	94,971	31,775	0	28,0	0	3,649	7,03	3	4	41,039	8,510

² - In the Everglades Agricultural Area no panther telemetry points have been recorded in the 39,401 acres which is in sugar cane.

Florida scrub-jay

Florida scrub-jays or Florida scrub-jay habitat may occur within the footprint of nine CERP projects. One of these projects, the Lake Okeechobee Watershed Project, could potentially adversely modify between a low estimate of 22,967 acres to a high estimate of 32,579 acres. One project is expected to beneficially modify 1,081 acres of Florida scrub-jay habitat. The Florida scrub-jay analysis was among the most conservative we performed. A number of habitats, such as improved pastures, that would only be suitable under unusual conditions were considered suitable. Additionally, the Lake Okeechobee Watershed Project analysis was unable to narrow down those habitats most likely to be suitable due to very high uncertainty on project siting. If this PDT conducts further analysis to better define suitable Florida scrub-jay habitats and avoids them in the site selection process, all of these potential impacts could likely be avoided with little to no impact on the project purposes or cost.

Plants and Invertebrates

Beautiful pawpaw or beautiful pawpaw habitat may occur within the footprint of four CERP projects. These four projects could adversely modify an estimated 72 acres of beautiful pawpaw habitat. No projects that might provide beneficial beautiful pawpaw habitat modifications were identified. This potential impact will likely be avoided as the C-43 Basin Projects PDT narrows down potential sites, conducts surveys and finalizes project details.

High pine-scrub plants or high pine-scrub plant habitat may occur within the footprint of three CERP projects. One of these three projects, Indian River Lagoon - South, could beneficially modify an estimated 1,081 acres of high pine-scrub plant habitat. No projects that might adversely modify high pine-scrub plant habitat were identified. These benefits again underscore the conservation importance of the Indian River Lagoon - South natural storage areas.

Okeechobee gourd or Okeechobee gourd habitat may occur within the footprint of 11 CERP projects. Three projects could potentially adversely modify between a low estimate of 100 acres to a high estimate of 1,343 acres and beneficially modify 3,500 acres of Okeechobee gourd habitat. Although large areas of suitable gourd habitat occur within the potential footprint for these CERP projects, Service species experts have determined that the likelihood of occurrence within these habitats is very low. Therefore, as detailed surveys are performed and potential sites chosen, actual impacts to this species can likely be avoided entirely without impacting project purposes.

Pine rockland plants or pine rockland plant habitat may occur within the footprint of three CERP projects. At this time, no projects are expected to adversely or beneficially modify pine rockland plant habitat.

Schaus swallowtail butterfly habitat occurs within the footprint of one CERP project that is expected to beneficially modify 5 acres of habitat.

Tiny polygala or tiny polygala habitat may occur within the footprint of three CERP projects. At this time, no projects are expected to adversely or beneficially modify this species' pine rockland habitat.

Little is known about listed plant occurrence in unsurveyed suitable habitats. Surveys for species in suitable habitats and development of plans for protecting populations and suitable habitats should be priorities for incorporation into project PDT analyses and alternative development.

Red-cockaded woodpecker

Red-cockaded woodpeckers or red-cockaded woodpecker habitat may occur within the footprint of ten CERP projects. These 10 projects could potentially adversely modify between a low estimate of 16,052 acres to a high estimate of 20,162 acres and beneficially modify 15,159 acres of red-cockaded woodpecker habitat. Although large areas of suitable habitat occur within the potential footprint for these CERP projects, it is likely that very little of this habitat is occupied and the Service has determined that occupation of additional habitat in south Florida is not required for the recovery of this species (Service 1999). Therefore, as detailed surveys are performed and potential sites chosen, actual impacts to this species can likely be substantially reduced without impacting project purposes. All of the potential benefits are estimated from the Indian River Lagoon - South Project, again emphasizing the importance of the conservation features of this project.

Sand and blue-tail mole skinks

Although sand and blue-tailed mole skinks and habitat for these two skink species might occur within the planning areas for two CERP projects, it is not anticipated that they will be affected by construction activities. At this time, no projects are expected to adversely or beneficially modify sand or blue-tailed mole skink habitat.

Sea turtle species

Sea turtle foraging habitat may occur directly downstream of seven CERP projects. There was only one project, Indian River Lagoon - South, for which enough information was available to estimate potential effects. We estimated beneficial modification of 920 acres of sea turtle species foraging habitat. Other CERP hydrologic effects may provide further benefits to foraging sea turtles.

West Indian manatee and designated critical habitat

West Indian manatees or West Indian manatee habitat may occur within the footprint of 32 CERP projects. Potential impacts are described in the individual sections for these projects. Table S-3 summarizes a draft preliminary analysis of CERP project access, and potential construction and hydrologic effects to manatees developed by the CERP Interagency Manatee Task Force.

Table S-3. Initial analysis of West Indian manatee access to Comprehensive Everglades Restoration Plan (CERP) projects and potential construction and hydrological effects. CERP projects are arranged by geographic region. Columns 1 and 2 display U.S. Army Corps of Engineers Work Breakdown Structure (WBS) numbers and project names. Column 3 indicates path of manatee access to project area. Columns 4 and 5 indicate potential construction and hydrologic effects to manatees or manatee habitat. (Adapted from: CERP Interagency Manatee Task Force [January 22, 2004].)

WBS	CERP Project	Manatee Access	Construction Effects	Hydrologic Effects
Lake Okeechobee				
1, 2	Lakes Okeechobee and Istokpoga	via Lake Okeechobee tributaries	construction, new structures	none anticipated
3, 32	Lake Okeechobee ASR/ASR Pilot	intake and outflow structures	construction, new structures	water quality, thermal
Caloosahatchee River and Estuary				
4	C-43 Storage Reservoir	Berry Groves (flap gate removed)	construction, new structures	altered flows to Caloosahatchee, seagrass redistribution, thermal
5	Caloosahatchee ASR	intake and outflow structures	construction, new structures	same as above, plus ASR water quality
6	Caloosahatchee Backpumping with Stormwater Treatment	intake and outflow structures	construction, new structures	altered flows, seagrass redistribution
33	Caloosahatchee ASR Pilot	via Caloosahatchee River	none anticipated	altered flows, water quality, thermal
Indian River Lagoon and St. Lucie Canal				
7	Indian River Lagoon - South	via C-44	construction, new structures	altered flows, seagrass redistribution
Central Everglades Region				
8, 9	Everglades Agricultural Area - Parts 1 and 2	via Miami, North New River, Bolles, and Cross Canals	construction, new structures	none anticipated
10	Big Cypress/L-28 Modifications	via S-140 lift gate and G-155	construction, new structures	none anticipated
11	Flow to NW & Central WCA-3A	via Lake Okeechobee and L-28	construction, new structures	none anticipated

WBS	CERP Project	Manatee Access	Construction Effects	Hydrologic Effects
12, 13	WCA Decomartmentalization - Phases 1 and 2	via Lake Okeechobee	dredge/backfill, add/remove structures	system-wide hydrologic effects, manatee redistribution
14	Lox NWR Internal Structures	not accessible	none anticipated	none anticipated
15, 16	Holey Land & Rotenberger WMA	via Lake Okeechobee	construction, structures	water re-regulation
23	Flows to Eastern WCA	via Lake Okeechobee, L-30/L-33	construction, new structures	none anticipated
26	Central Lake Belt Storage Area	via C-6 to L-33	construction, new structures	none anticipated
27, 36	Everglades NP/L-31N Seepage	via Lake Okeechobee	construction, new structures	none anticipated
31	Florida Keys Tidal Restoration	via Atlantic and Florida Bay	construction, new structures	none anticipated
35	Lake Belt In-ground Res. Pilot	via C-6 and C-9	construction, new structures	none anticipated
47	WCA-3A/3B Flows to Central Lake Belt Storage Area	via Lake Okeechobee, culvert in L-37	construction, new structures	none anticipated
48	WCA-2B to Everglades NP	via North New River	construction, new structures	none anticipated
90	Miccosukee Water Management	via Lake Okeechobee and L-28N	construction, new structures	none anticipated
	North New River	via G-54 Lift-gate	construction, new structures	none anticipated
Palm Beach County				
17, 18	North Palm Beach Part 1	not accessible	none anticipated	altered flows, seagrass changes in Loxahatchee River and Lake Worth Lagoon
20, 21	Palm Beach County Ag. Reserve	not accessible	none anticipated	none anticipated
22, 34	Hillsboro ASR & ASR pilot	not accessible	none anticipated	none anticipated
38	Acme Basin B Discharge	not accessible	none anticipated	none anticipated
39	Strazzulla Wetlands	not accessible	none anticipated	none anticipated
40	Site 1 Hillsboro Impoundment	not accessible	none anticipated	none anticipated
Broward County				
24	Broward Secondary Canal System	via Hillsboro, C-13, C-12, C-9	construction , new structures	flow redistribution

WBS	CERP Project	Manatee Access	Construction Effects	Hydrologic Effects
25	North Lake Belt Storage Area	via NN River and C-6 pump	construction , new structures	flow redistribution
45	Broward WPAs	C-9 is accessible, C-11 is not	construction , new structures	none anticipated
Miami-Dade County				
28	Biscayne Bay Coastal Wetlands	via C-1, 100, 102, 103, etc.	backfill canal, new structures	short-term seagrass loss, flow and manatee redistribution
29	C-111 Spreader Canal	up to S-197, via Lake Okeechobee	backfill canal, new structures	freshwater and manatee redistribution
37, 97, 98	Wastewater Reuse Pilot, West and South Miami-Dade Reuse			increase flow to Biscayne Bay
43	Bird Drive Recharge Area	via C-2, Bird Dr, Krome Ave.	construction , new structures	flow redistribution
46	C-4 Structure	via C-2, 4, 6,	construction , new structures	flow redistribution to Biscayne Bay
49	WPA Conveyance	via C-6, Russian Colony, and Pennsuco	construction , new structures	flow redistribution
Southwest Region				
30	Southern Golden Gate Estates Restoration	south of State Route 41	none anticipated	freshwater and manatee redistribution
93	Henderson Creek/Belle Meade	not accessible	none anticipated	flow redistribution
94	Lakes Park Restoration	via Hendry Creek	construction	none anticipated
Other Projects				
44	ASR Regional Study	Caloosahatchee, St. Lucie, Lake O	seismic surveys	none anticipated

Note: All Stormwater Treatment Areas (STAs), except STA-1E, are accessible to manatees.

Additional abbreviations used in this table: ASR - Aquifer Storage and Recovery, C-1 (example) - Canal number, G-155 - Gate number, L-28 (example) - Levee number, Lox NWR - Arthur R. Marshall Loxahatchee National Wildlife Refuge, NP - National Park, NW - Northwest, Res. Reservoir, S-140 (example) - Structure number, WCA-3A (example) - Water Conservation Area number, WMA - Wildlife Management Area, WPA - Water Preserve Area.

Whooping crane

In South Florida, the whooping crane is listed as a non-essential, experimental population. Whooping cranes may occur within the planning area for two CERP projects, but the projects are not expected to affect whooping cranes.

Wood stork

Wood storks or wood stork habitat may occur within the footprint of 44 of the 54 CERP projects analyzed. Thirty-eight of these projects could potentially adversely modify between a low estimate of 143,180 acres to a high estimate of 154,633 acres and beneficially modify 80,022 acres of wood stork habitat. Our analysis for this species was conservative and included many habitats, such as improved pastures, row crops and sugarcane fields, that would be suitable only seasonally or irregularly. While such habitats are important to non-breeding individuals, they are widespread throughout the project area and are not known to be a limiting factor for the species (Service 1999). Additionally, as siting is completed for the Lake Okeechobee Watershed and C-43 Basin Projects, we expect that the estimate for acres adversely impacted will drop substantially. The habitats most important to the future survival and recovery of wood storks in south Florida are natural wetlands providing a reliable source of high-quality prey patches during the nesting season within foraging distance of major wood stork rookeries (Service 1999). CERP footprint impacts on these habitats are likely to be small and we expect that CERP hydrologic effects will improve large areas of these foraging habitats.

MSRP ecological communities

MSRP ecological communities may occur within the footprint of 41 of the 54 CERP projects analyzed. Table S-4 shows the number of acres within the CERP footprints of these projects. In some cases, CERP footprints identified covered larger planning areas and we used these as surrogates for all projects within that planning area (e.g., Lake Okeechobee watershed, Caloosahatchee basin, etc.). Because there was overlap in the FLUCCS codes and MSRP ecological community matrix (Table M-3) three ecological community groups were created for purposes of calculating acres within CERP project footprints or planning areas: (1) high pine and scrub (scrub, scrubby flatwoods and scrubby high pine) communities, (2) cutthroat grass and wet prairie communities, and (3) forested swamp communities (seepage swamps, flowing water swamps, and pond swamps) were combined when calculating acres of each community occurring within CERP project or analysis area footprints. We did not estimate the number of MSRP ecological community acres that may be adversely or beneficially impacted by each CERP project because this may vary based on project siting as well as project operations. We will continue to work with the Corps and the District project managers to identify and target the historic range of natural variability, the natural and anthropogenic disturbances to these systems, and the desired future conditions for natural communities occurring within the Everglades landscape. We encourage Corps and District project managers to develop individual CERP project alternatives that minimize adverse and maximize beneficial impacts to natural communities at local and landscape scales within the CERP planning area.

Table S-4. Initial analysis of Multi-species Recovery Plan (MSRP) ecological community acres within footprints of Comprehensive Everglades Restoration Plan (CERP) projects.

WBS	Project Area ¹	High Pine - Scrub	Mesic Temperate Hammock	Pine Rocklands	Mesic Pine Flatwoods	Hydric Pine Flatwoods	Dry Prairie	Cutthroat grass/ Wet Prairies	Fresh-water Marshes	Forested Swamps	Man-groves	Coastal Salt Marsh	Sea-grass
1,2,3,32	Lake Okeechobee watershed	179	242		682			250	301				
4,5,6,33	Caloosahatchee basin							0	22	64			
7	Indian River Lagoon-South	1,555	2,781		13,618	346	1,677	6,077	9,310	9,641	194		
8,9	Everglades Agricultural Area Storage							131	10,929	21			
10,11	Big Cypress / L-28 Interceptor Modifications							12		571			
12,13	Water Conservation Area - 3							14	507,069	18,456			
15	Modify Holey Land WMA Operation Plan								30,605	3,646			
16	Modify Rotenberger WMA Operation Plan						41		25,739	2,907			
17,18	North Palm Beach County		5		876			45	737	1,977			
20,21	Palm Beach County Agricultural Reserve	2								103			
22,34,40	Hillsboro watershed	64	30		104				13	10			
23	Flow to Eastern Water Conservation Area								10				
25	North Lake Belt Storage Area	19		480				40	41	15			
27	Everglades National Park Seepage Managemt.								1,201				
28	Biscayne Bay Coastal Wetlands				246			531	14,784	3	5,169	731	0
29	C-111 Spreader Canal								22,325	1,037	3,039		0
30	Southern Golden Gates Estates Restoration	106			1,104	45,693	20	5,081	1,007	6,638	17	48	
31	Florida Keys Tidal Restoration										0		9
36	L-31 N Seepage Management Pilot								1,201	87			
39	Strazzulla Wetlands		10			320		30	925	1,901			
43	Bird Drive Recharge Area								4,295	7			
45	Broward County Water Preserve Areas	45	24						2,107	482			
48	WCA 2B Flows to Everglades National Park								565				
49	WPA Conveyance							5					
90	Miccosukee Water Management Plan		159					2,195	78,541	31,663	17	34	
93	Henderson Creek / Belle Meade Restoration	141			4,956	29,423	113	749	26	14,220	13	7	
94	Lakes Park Restoration				102								
98	South Miami-Dade Reuse										23		
	Totals	2,111	3,251	480	21,688	75,782	1,851	15,160	711,753	93,449	8,472	820	9

¹ - MSRP ecological communities do not occur within the CERP footprint of projects 14, 24, 26, 35, 37, 38, 44, 46, 47, 48, 91, 92, 95, and 97.

Conclusions

We identified six species or species groups (bald eagle, Everglade snail kite, sea turtles, Schaus swallowtail butterfly, high pine scrub plants and the Okeechobee gourd) for which the beneficial footprint effects of CERP are likely larger than the negative footprint effects. As CERP projects and analyses are further refined we expect reduced negative footprint effects estimates for the bald eagle and Okeechobee gourd. We identified eight species (Audubon's crested caracara, Florida grasshopper sparrow, Florida scrub-jay, Red-cockaded woodpecker, wood stork, American crocodile, Eastern indigo snake and beautiful pawpaw) for which the likely negative footprint effects of CERP are larger than the likely beneficial footprint impacts. Of these eight, the conservative nature of our analysis and the high uncertainty of siting information for some projects likely led to a substantial overestimation of adverse effects for the Audubon's crested caracara, Florida scrub-jay and the Red-cockaded woodpecker. We expect that more refined PDT analyses and project siting information combined with analysis of the likely beneficial effects of CERP hydrologic changes would lead to an overall positive impact of CERP on the wood stork and American crocodile and the avoidance of all adverse effects on the beautiful pawpaw. Future analyses for the remaining two species, the Florida grasshopper sparrow and the Eastern indigo snake, will likely continue to show net negative effects.

As expected, a large wetlands restoration project such as the CERP is likely to have some substantial negative effects on species that require upland habitats as all or a portion of their range. The large storage area projects contribute most to these negative effects since they are to be built on large areas of mostly upland habitat. PDTs for these projects have opportunities to substantially reduce these impacts by siting storage reservoirs and STAs in areas of minimal value to listed species, by reducing the footprint size of their projects and through exploration of alternative storage components such as natural storage areas. Perhaps the most important opportunity of this kind would be avoiding placement of the C-43 Basin projects on potential Florida grasshopper sparrow habitat and an important Audubon's crested caracara juvenile congregation area. This could eliminate impacts on up to 3,715 acres of potential Florida grasshopper sparrow habitat and up to 6,817 acres of Audubon's crested caracara habitat. In addition, land acquisition, water storage siting, and final alternative selection for several key CERP projects including the Southern Golden Gates Hydrologic Restoration, Indian River Lagoon - South, and Caloosahatchee basin and Lake Okeechobee watershed projects could improve our initial analysis of potential effects to panther habitat values within the Everglades ecosystem.

Our analysis underscores the crucial role of the natural storage areas that are part of the Indian River Lagoon - South Project. These features provide all or the large majority of estimated benefits for seven species and, in several cases, create a positive overall balance of CERP effects for these species. Loss of these features from the CERP would create a very large compensation need in order to balance likely CERP adverse effects. Incorporation of further natural storage area components into other CERP projects such as the Lake Okeechobee Watershed Project and C-43 Basin Projects would provide further multi-species benefits.

Conservation of listed species and ecological communities

In addition to the potential to minimize adverse effects for listed species identified above, CERP PDTs may identify additional actions, or conservation measures, that may contribute to the recovery of listed species or the ecological communities on which they depend. The number of species and large spatial extent of potential effects identified in this report affirm the opportunity for CERP projects to include positive actions to conserve multiple listed species. Potential proactive conservation actions were identified in the MSRP (Service 1999) and are summarized for the species and ecological communities that CERP projects may affect in Appendix C. The recommendations section of this report contains further conservation recommendations that may increase the beneficial impacts of the CERP on listed species, including a section on wildlife features that may improve the habitat quality of STAs and reservoirs. In addition, the Service will work with the Corps and the District in an interagency format to develop an overall CERP conservation strategy for these listed species and south Florida ecological communities.

Recommendations

Surface and in-ground water storage reservoirs and stormwater treatment areas

In light of the large acreage of proposed CERP reservoirs and STAs, the Service in coordination with the FWC developed draft fish and wildlife enhancement recommendations to be considered in the design and operation of these facilities. Recommendations considered compatibility with management and operation of facilities for their principal purposes of phosphorus removal and water storage. The draft recommendations and associated introductory text is included in Appendix E. Further refinement of these recommendations is anticipated through a future workshop.

Aquifer storage and recovery pilot projects

The primary goal of the ASR pilot projects is to reduce uncertainties associated with ASR facilities proposed at unprecedented scale for the CERP. Recent changes to the planning schedule for these projects have resulted in the three originally proposed pilot studies (Lake Okeechobee, Caloosahatchee River, and Hillsboro), at five locations, being combined into one Pilot Project Delivery Report and Environmental Impact Statement. The Service's planning objectives for these projects are to conduct successful ASR pilot operations with a minimal amount of entrainment and impingement of aquatic organisms at intake structures and minimal adverse effects on receiving surface waters and trust resources while reducing uncertainty in the effects of ASR operation on surface water ecosystems. It was with these objectives in mind that the Service provided a list of recommendations in our November 6, 2003, Draft FWCA Report. These recommendations will be updated in our Final FWCA Report.

Wastewater reuse

The Service provided comments on wastewater reuse projects in a September 30, 2003 PAL. In general, these projects could adversely affect wood storks, Eastern indigo snakes, and American crocodiles. Any adverse effects could be avoided or minimized by incorporating the Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region, U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area*, during project planning. In addition, project managers should consider setting operational criteria to mimic natural water depths and changes during potential dry downs to concentrate prey in a manner that may benefit wood stork usage of the test cells and to manage canopy densities in the impoundments to maintain wood stork foraging habitat and to allow wood stork foraging. *Standard Protection Measures for the Eastern Indigo Snake* should be implemented during project construction. Berms should be constructed parallel to roadways to deter crocodiles from entering or crossing roadways.

Removal of barriers to flow

The Service provided detailed comments and recommendation on removal of flow barriers in a June 13, 2002 FWCA Report for the *WPA Feasibility Study* (Corps 2001). In general, CERP project managers should consider removing portions of roads, levees, canals, and other barriers to flow to create a mosaic of upland and wetland habitats that may mimic historic or natural conditions to improve habitat complexity and to restore historic or natural hydrological regimes, especially within the freshwater-saltwater interface to improve hydrology and restore freshwater and saltwater communities.

Operational changes

The Service will provide more detailed comments and recommendation on CERP operational changes in later PALs or PARs as these features receive more attention from the Corps and District.

Listed species and ecological community recommendations

The species-specific recommendation below were assembled from the individual project narratives provided within this PAR. They will be refined and updated as further interagency coordination to avoid and minimize individual CERP project and overall CERP program-level effects on listed species is accomplished.

American crocodile

1. Assess pre and post-project crocodile nesting or sighting information to determine if changes in hydrology have contributed to additional habitat protection or use.
2. Consider removing portions of the Road-To-Nowhere to create islands. This may restore water flow while retaining resting sites for the crocodiles. Crocodile nesting may be improved by islands, which may be better defended from raccoons predation on crocodile nests.
3. Restore a more natural hydrological regime within the vicinity of Road-To-Nowhere to improve salt marsh in the surrounding area.
4. Re-direct canal water into coastal wetlands to restore salinities to more natural, mesohaline conditions (5 to 19 ppt) to enhance juvenile crocodile habitat as juveniles exhibit higher survival and growth rates in salinities of 0 to 20 ppt.
5. Restore the natural creek system in the coastal wetlands that historically served to convey water from freshwater wetlands and sloughs through the estuarine wetlands to Biscayne Bay. These creeks would serve as deep water refugia for crocodiles, and would

compensate for potential loss of habitat by the proposed backfilling of major east-west drainage ditches that may presently serve as crocodile deep water refugia.

6. Remove unnecessary roads and create wildlife corridors beneath or through roadways to reduce crocodile mortality caused by motorized vehicles, particularly along U.S. Highway 1 and Card Sound Road. Monitor the effectiveness of installing passages beneath roadways, such as culverts, to assess use to improve designs for future wildlife road crossings.

Audubon's crested caracara

7. Conduct site specific surveys within habitat types use by caracaras for feeding, nesting and roosting, including much of what exists as natural lands, particularly outside of known nesting areas and within the range of the caracara. Nesting is typically in cabbage palms surrounded by open, low ground cover areas. Foraging areas including pine flatwoods, mixed wetland hardwoods, cypress, freshwater marsh, wetland forest, temperate hardwoods and wet prairie and man-made habitats such as improved pasture, row crops, open agricultural lands, and roadway and power line corridors.
8. Consult the Service's *Habitat Management Guidelines For Audubon's Crested Caracara In Central and Southern Florida* during project planning to reduce potential adverse effects to new or as yet undiscovered caracara nests during construction.
9. Minimize disturbance at juvenile congregation areas during the appropriate time (dates).
10. Minimize construction disturbance within the Primary and Secondary Zones of nest sites. After site selection of potential wells, consultation will need to be reinitiated to determine the impact to caracara reproduction.
11. Monitor project sites during construction activities within the current range of the caracara to detect foraging, roosting, or congregating behaviors. If caracaras are observed, consult with the Service to determine the appropriate next steps to minimize disturbance.

Bald eagle

12. Incorporate *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* recommendations into projects that will involve new pump stations and power line construction near detention/retention areas that may pose an electrocution hazard to protect bald eagles from electrocution.
13. Consult the Service's *Habitat Management Guidelines for the Bald Eagle in the Southeast Region* and during project planning.

14. Monitor prior and during construction to detect new or as yet undiscovered bald eagle nests, or foraging or roosting behaviors. If bald eagles are observed, consult with the Service to determine the appropriate next steps to minimize disturbance.
15. Minimize disturbance to foraging eagles during project construction. The Service has no specific guidelines to minimize take of a foraging eagle. However, project managers and construction crews should be aware of the potential presence of eagles and the potential for disturbing a foraging or roosting eagle.

Beautiful pawpaw

16. Survey properties within western Charlotte and Lee Counties that contain xeric, mesic, and hydric pine flatwoods considered for acquisition as part of these projects for the presence of the beautiful pawpaw prior to selection of a preferred alternative.
17. Avoid siting of reservoirs in pine flatwoods.
18. Avoid beautiful pawpaw habitat within the Caloosahatchee Basin when selecting sites for reservoirs and related construction activities.

Cape Sable seaside sparrows

19. Avoid construction during critical nesting periods or implement measures to avoid disturbance during construction of the STA and C-111 spreader canal.

Eastern indigo snake

20. Reduce or eliminate the potential for eastern indigo snakes to be injured or killed on new roads with associated vehicular traffic.
21. Implement the Service's *Standard Protection Measures for the Eastern Indigo Snake* during project construction where suitable habitat for the eastern indigo snake exists. Included these measures in the environmental protection plan when the Corps proceeds to the plans and specifications phase for the project
22. Reinitiate consultation with the Service when more specific details (*i.e.*, ASR site selection) are developed.
23. Create littoral shelves with interspersed uplands that may provide suitable eastern indigo snake habitat at some water elevations in water storage areas.
24. Maintain some upland areas when roads are degraded in water storage areas.

25. Create some habitat improvements near roads in water storage areas.
26. Remove exotic plants as part of proposed reservoir development.
27. Intersperse uplands in water storage areas.
28. Manage water storage areas with a slow inundation process to provide additional eastern indigo snake habitat benefits throughout these acres.
29. Retaining segments of road to serve as upland “islands” to reduce impacts on indigo snakes incurred by removing roads or levees, or decompartmentalizing areas, to reestablish connectivity between basins, which will means. Eastern indigo snakes are known to utilize tree islands, roads, and levees.
30. Monitor the hydrological effects of the project design by conducting an additional baseline vegetation transect study in 2004 and conducting post-project transect studies (5-year intervals for 20 years).
31. Monitor the hydrological effects of the project design by monitoring surface and groundwater data in all existing and proposed wells and compare to baseline conditions.
32. Assess operational plan effects on project uplands and wetlands. Modify to improve restoration benefits if warranted. Restoration is defined as pre-development condition of uplands and wetlands.
33. Assess the potential for exotic fish populations to move from canals to natural wetlands and affect wood stork forage fish populations post-restoration.

Everglade snail kite

34. Design and construct surface water storage, reservoirs, and stormwater treatment areas to improved for apple snails and snail kite nesting and foraging by incorporating ground level and vegetation variability similar to historic natural conditions. Specifically, include woody vegetation for nesting, construct of perch sites, include emergent vegetation for apple snails, include littoral zones, etc.
35. Operate water storage and treatment areas to improve suitable conditions for apple snail populations and snail kite nesting and foraging where any potential conflicts can be minimized. Specifically, coordinate water depths; drying and filling timing, rates and patterns; and other operations to maintain suitable conditions for apple snail populations and snail kite nesting and foraging conditions will provide the greatest benefits.

36. Coordinate maintenance of water storage features to minimize adverse effects to apple snails and snail kites.
37. Coordinate operation plans with the St. John's River Water Management District.
38. Prioritize apple snail and snail kite habitat needs for projects that include or are in the vicinity of snail kite critical habitat.
39. Monitor the hydrological effects of the project design by conducting an additional baseline vegetation transect study in 2004 and conducting post-project transect studies (5-year intervals for 20 years).
40. Monitor the hydrological effects of the project design by monitoring surface and groundwater data in all existing and proposed wells and compare to baseline conditions.
41. Assess operational plan effects on project uplands and wetlands. Modify to improve restoration benefits if warranted. Restoration is defined as pre-development condition of uplands and wetlands.
42. Assess the potential for exotic fish populations to move from canals to natural wetlands and affect wood stork forage fish populations post-restoration.

Florida perforate cladonia, and four-petal pawpaw

43. Survey scrub habitats in Palm Beach, Martin, St. Lucie, Polk, and Highlands Counties for the presence of the Florida perforate cladonia, and four-petal pawpaw prior to siting features in these habitats or selection of a preferred alternative.
44. Avoid siting STAs or reservoirs or incurring ancillary effects (*e.g.*, interrelated actions like residential housing and commercial developments that may destroy suitable habitat) from construction and maintenance in scrub locations that are well-drained and structurally open where Florida perforate cladonia and four-petal pawpaw reside.

Florida grasshopper sparrow

45. Avoid impacts on currently occupied habitat and on potential habitat that is determined to be critical to recovery of the species during project planning in Highlands, Okeechobee, Osceola, Polk, and Glades Counties. Avoid areas identified by Shriver and Vickery (1999) as potential grasshopper sparrow habitat, including areas extending from northern Glades County south to the Caloosahatchee River vicinity.

Florida panther

46. Consult the *Landscape Conservation Strategy for the Florida Panther in South Florida* (Service 2002a) during project planning. Continue to coordinate with the Florida Panther Subteam of the Multi-species/Ecosystem Recovery Implementation Team to ensure that the C-43 project design is compatible with recovery efforts for the panther.
 - a. Avoid high quality panther habitat when siting CERP features, such as reservoirs and surface water storage areas, particularly in primary and dispersal zones.
47. Protect habitat within adult panther home ranges.
48. Provide corridors for dispersal of juvenile panthers between larger areas of contiguous habitat.
49. Provide panther dispersal conditions across the Caloosahatchee River, between existing primary habitat south of the river and habitat that is presently only occasionally used by panthers north of the river.
50. Conduct a 1-year pre-project baseline and post-project (5-year intervals for 20 years) prey density studies using aerial transects consistent with FWC-recommended methodology.
51. Assess and characterize pre-project panther telemetry in the project area to include Fakahatchee, BCNP, Belle Meade portion of Picayune Strand State Forest, and Florida Panther National Wildlife Refuge. Assess and characterize post-project panther telemetry including abundance and distribution of panthers over landscape, changes in habitat utilization if any, numbers of breeding females, and changes in population age distribution. Post-project assessment should be conducted every 3 years.
52. Coordinate with FWC to determine if panther denning activities are occurring in potential project construction areas.
53. Assess road plan effects on Florida panther.
54. Assess recreational or management effects on Florida panther if adopted as part of the federal project or state management plan consideration.

Florida scrub-jay

55. Avoid scrub habitats at higher elevations that have highly drained soils that provide habitat for Florida scrub-jays.

Okeechobee gourd

56. Survey freshwater marsh and pond swamp habitats Palm Beach, and Okeechobee Counties for the presence of the Okeechobee gourd prior to siting features in these habitats or selection of a preferred alternative. Conduct surveys for the Okeechobee gourd along these canals in the North New River Canal in Broward County and the levees and wetlands along the Miami Canal within the Decomp project area prior to initiating construction activity.
57. Protect any new populations of the Okeechobee gourd detected during surveys conducted for CERP projects.
58. Protect populations of the Okeechobee gourd in the littoral zone of Lake Okeechobee for any projects that may directly impact the site and when planning water management in the Lake for the C-43 Reservoir project.
59. Avoid Okeechobee gourd habitat within the Caloosahatchee Basin when selecting sites for reservoirs and related construction activities.

Pine rockland plants

60. Survey pine rockland habitats Miami-Dade Counties for the presence of the crenulated lead plant and Garber's spurge prior to siting features in these habitats or selection of a preferred alternative.
61. Protect pine rockland habitat and all populations of crenulated lead plant and Garber's spurge found during surveys.
62. Avoid siting STAs or reservoirs or incurring ancillary effects (*e.g.*, interrelated actions like residential housing and commercial developments that may destroy suitable habitat) from construction and maintenance in scrub, pine rockland, high pine, sandhill, and open coastal spoil where crenulated lead plant and Garber's spurge resides. Avoid or minimize alteration of the xeric conditions and fire regimes along the coastal ridge. Also avoid impacting marl prairies (transverse glades) with slash pine, saw palmetto, wax myrtle, and poisonwood where the crenulated lead plant may also reside.
63. Establish and implement a fire management program to maintain crenulated lead plant and Garber's spurge associated with pine rocklands habitat. Monitor effectiveness of fires and adjust burn plans as necessary to maintain and improve listed plant populations.
64. Remove and control invasive non-native species in pine rockland ecological communities.

Red-cockaded woodpecker

- 65. Survey suitable habitats on to evaluate the distribution of red-cockaded woodpeckers on private lands in the CERP area.
- 66. Minimize the conversion of pine flatwood habitats to water storage or treatment areas.
- 67. Conduct/assess baseline population surveys of red-cockaded woodpecker's within Belle Meade, SGGE, Fakahatchee, and BCNP.
- 68. Conduct/assess post-project baseline population surveys of red-cockaded woodpecker's in Belle Meade, SGGE, Fakahatchee, and BCNP at 5-year intervals beginning 5 years after project completion.

Schaus swallowtail butterfly

- 69. Restore the hydrology on the Deering Estate to benefit Schaus swallowtail host plant habitat, by properly implementing sub-component 1 of the Biscayne Bay Coastal Wetlands project.
- 70. Create additional upland habitat and plant with hardwood hammock species, with particular emphasis on torchwood and wild lime host plants and nectar source species such as wild coffee pigeon-plum, and guava in the created upland habitat.
- 71. Remove exotic vegetation in Schaus swallowtail habitat and in adjacent upland buffers. However, special consideration may be necessary for guava which is listed by the State as one of Florida's most invasive exotic species, but has also been shown in recent studies to be a preferred nectar source for Schaus' swallowtails. Eradication of this pest species by resource managers in Schaus habitat may adversely affect recovery of the butterfly. Many species of butterflies in addition to the Schaus swallowtail butterfly are attracted to these host plants, creating a unique opportunity to observe endangered species in a residential setting.
- 72. Restrict application of chemical pesticides within or provide a buffer around areas that maintain the food plants of the Schaus swallowtail. Insecticides used for mosquito, agricultural and residential pest control have been shown to have toxic qualities towards numerous butterfly species found in south Florida and the keys, including the Schaus' swallowtail.
- 73. Develop an effective fire management plan, if necessary to maintain restored habitat, that does not destroy tropical hardwood hammock habitat thereby reducing suitable habitat for the Schaus swallowtail butterfly. If fire is required then prevent direct clearing and

disturbance of tropical hardwood hammock habitat and direct new construction activities to areas already cleared or previously disturbed.

Sea turtle species

74. Restore a more natural flow down the Caloosahatchee River, St. Lucie River, and into other estuaries, possibly providing more productive foraging areas for sea turtles.

Tiny polygala

75. Survey pine rockland habitats Miami-Dade Counties for the presence of the tiny polygala prior to siting features in these habitats or selection of a preferred alternative.
76. Protect pine rockland habitat and all populations of tiny polygala found during surveys.
77. Avoid siting STAs or reservoirs or incurring ancillary effects (*e.g.*, interrelated actions like residential housing and commercial developments that may destroy suitable habitat) from construction and maintenance in scrub, pine rockland, high pine, sandhill, and open coastal spoil where tiny polygala resides. Avoid or minimize alteration of the xeric conditions and fire regimes along the coastal ridge.
78. Avoid siting project features in the approximately 150 acres of pine rocklands on the Deering Estate.

West Indian manatee

The following recommendations to conserve and recover manatees are intended to be integrated into the CERP Project Planning, Construction, Operation and Maintenance, and Monitoring and Adaptive Assessment Phases for all CERP projects located in manatee-accessible waters.

79. Manage manatee access in the C&SF Restudy project area.
 - a. In coordination with the CERP Interagency Manatee Task Force, examine the feasibility of constructing manatee barriers at S-351, S-352, and S-354 at Lake Okeechobee and the Miami Canal/L-30 intersection (culverts at the S-31, S-32, S-32A, and S-337) to prevent manatee access into the inland C&SF canal system in order to avoid CERP and manatee conflicts and to promote manatee recovery by eliminating an ongoing source of manatee entrapment.
 - b. Avoid CERP and manatee conflicts by excluding manatee access consistent with recommendations generated from above in the following nine CERP projects:

Everglades Agricultural Area Storage Reservoirs (Parts 1 and 2)

Flows to Northwest and Central WCA 3A Project
Decomartmentalization (Parts 1 and 2)
Big Cypress L-28 Project
Flows to Eastern WCAs Project
L-31N Seepage Management Project
WCA 3A and 3B Flows to the Central Lake Belt Storage Area Project
Miccosukee Water Conservation Project
C-111 Spreader Canal Project

80. Manage manatee access at CERP projects. Each Project Delivery Team should develop individual CERP project Manatee Protection Plans, which include manatee exclusion devices in CERP project Design and Specifications to minimize or avoid manatee structure-related injury and mortality for all CERP projects located in manatee-accessible waters (see Appendix D for preliminary guidance).
81. Reduce or eliminate manatee construction-related disturbance, injury, and mortality in CERP project areas by implementing the Service's *Standard Manatee Protection Construction Conditions for Aquatic-related Activities*, appropriate protocols found in Appendix D, and any subsequent protocols developed by the CERP Interagency Manatee Task Force in all waters accessible to manatees.
82. Structure and Lock Operations
 - a. In coordination with the Task Force on Structure-related Manatee Mortality, update or modify existing operational protocols for structures and locks to reduce manatee mortality at existing Central and Southern Florida Project structures and new CERP structures. Targeted efforts need to be made to reduce or eliminate manatee mortality at the sixteen navigational lock and water control structures that have historically caused manatee deaths recorded near Ortona Lock (S-78), S-77 at Moore Haven, the Franklin Lock (S-79), and the St. Lucie Lock (S-80) in the Okeechobee Waterway, and other selected structures, particularly in Miami-Dade County.
 - b. Prevent proximity of manatees to existing Central and Southern Florida Project structures and new CERP structures during operation of inflow/outflow structures (opening and closing) by using exclosures, by modifying structure operations, or by other appropriate measures.
 - c. Provide cross-training and manatee awareness for all Corps and District lock and structure operators on structure and lock operational procedures to reduce manatee conflicts (Draft Manatee Protection Plan, U.S. Army Corps of Engineers, South Atlantic Division, Jacksonville District, Standard Operating Procedure [CESAJ SOP] No. 1130-2-3, and appropriate District operational protocols).

- d. Base draft Water Control Plans that may change freshwater flows to estuaries on modeling to estimate any changes in abundance and distribution of submerged aquatic vegetation. Also consider maintaining or restoring freshwater supplies that manatees require to survive. Maintain a distribution of submerged aquatic vegetation beds in proximity to warm water refugia for manatees to reduce stress while traveling between water, food sources, and warm water during winter months.
83. Manage watercraft access and operation in the CERP planning area by include provisions to protect manatees from potential boat strikes and injury or mortality in future planning for specific CERP programs and projects, and in particular the CERP Master Recreational Plan. Include manatee speed zone posting, sign management, and educational material as part of an overall CERP manatee plan.
84. Integrate the Manatee Thermal Protocols (Appendix D) into future project planning to address thermal effects of ASR and redistribution of freshwater overland flows to minimize effects on manatees and important manatee warm water refugia.
85. Coordinate and incorporate manatee monitoring and adaptive assessment into the CERP.

In coordination with the CERP Interagency Manatee Task Force, RECOVER, and academia, develop a comprehensive science plan to identify baseline data needs, and monitoring and assessment needs to assess ecosystem responses (*e.g.*, shifts in seagrass abundance and distribution, changes to salinity) to CERP implementation and the long-term health of manatees. This science plan should include a schedule, important milestones, responsible parties, and a budget.

Following is an example of Manatee Monitoring and Adaptive Assessment Needs for the Southern Golden Gate Estates Project (SGGE).

Fund further development of spatially-explicit, individual-based models for manatees to better understand how changes in hydrology associated with the SGGE Project may affect the distribution and abundance of manatees. Initial construction of the individual-based model already has been accomplished through funding from USGS Place-Based Initiative. Four key GIS layers are used by the model. A detailed bathymetric layer will restrict the simulated movements of manatees to appropriate water depths. Initial analysis of the radio tracking data shows that most locations are in water of 12 feet or less. Salinity layers showing the location of freshwater (≤ 5 parts per thousand) will be used to identify areas where manatees periodically return to drink freshwater water. Radio tracking data and field mapping are being used to identify key foraging areas with high quality submerged aquatic vegetation. The fourth layer will identify sites that serve as winter thermal refugia.

Conduct a comprehensive field study in the SGGE region to provide data for the spatially-explicit model and to document the current distribution and status of the manatee

population prior to implementation of restoration activities. Two years of field data have already been collected through funding from USGS Place-Based Studies. Provide for at least one more year of baseline studies, conduct interim studies based on project schedule to determine effects of project phasing on manatees using an adaptive management approach, and conduct 3 years of post-restoration field studies.

Provide a baseline, mid-project, and post-project assessment on manatee aggregations (warm-water refugia) at the Port of the Islands Marina Basin.

Provide a baseline, mid-project, and post-project assessment of the Port of the Islands marina basin depth, temperature, and flow input from Faka Union Canal.

Conduct baseline and post-project (5-year intervals for 20 years) seagrass surveys in Faka Union Bay.

Conduct a pre-project analysis of boat traffic in the Faka Union Marina basin/Canal system and in adjacent restoration-affected bay systems based on available information. Use this analysis to determine the potential for boat-related mortality associated with potential manatee habitat use pattern changes associated with post-restoration changes in freshwater discharges.

Wood stork

86. Consult the Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region*, and *U.S. Fish and Wildlife Service Supplemental Habitat Management Guidelines for the Wood Storks In The South Florida Ecological Services Consultation Area* during project planning.

Based on the Service's *Habitat Management Guidelines for the Wood Stork in the Southeast Region*, to the maximum extent possible, feeding sites should be protected by adherence to the following habitat management protection zones and guidelines:

- a. There should be no human intrusion into feeding sites when storks are present. Depending upon the amount of screening vegetation, human activity should be no closer than between 300 feet (where solid vegetation screens exist) and 750 feet (no vegetation screen).
- b. Feeding sites should not be subjected to water management practices that alter traditional water levels or the seasonally normal drying patterns and rates. Sharp rises in water levels are especially disruptive to feeding storks.
- c. The introduction of contaminants, fertilizers, or herbicides into wetlands that contain stork feeding sites should be avoided; especially those compounds that could adversely

alter the diversity and numbers of native fishes, or that could change the characteristics of aquatic vegetation. Increase in the density and height of emergent vegetation can degrade or destroy sites as feeding habitat.

- d. Construction of tall towers (especially with guy wires) within three miles, or high power lines (especially across long stretches of open country) within one mile of major feeding sites should be avoided.
- 87. Include features to increase the wildlife value of the retention/detention areas during project planning, such as the creation of irregular shorelines, islands in open water areas, and functioning littoral wetlands to improve biological diversity and species abundance and water quality.
- 88. Vary ground elevations to provide both long-and short-legged wading birds favorable foraging conditions.
- 89. Maximize favorable foraging conditions during the wood stork nesting season (January through mid-August). Historically, wood storks nesting occurred earlier (November through June) and a return to this nesting period may indicate water management that more closely reflects historic conditions which may improve wood stork nesting success.
- 90. Create marsh flow-way and littoral zones to improve wood stork foraging when project sites are located outside of the 18.6-mile radius CFA of known wood stork colonies. Include emergent marsh vegetation cover to improve habitat for wood stork forage fish species.
- 91. Replace aquatic and upland exotic plant species with native vegetation to improve roosting and feeding habitat quality.
- 92. Designing canal improvements to provide suitable foraging habitat for wood storks on canal edges, when possible.
- 93. Monitor the hydrological effects of the project design by conducting an additional baseline vegetation transect study in 2004 and conducting post-project transect studies (5-year intervals for 20 years).
- 94. Monitor the hydrological effects of the project design by monitoring surface and groundwater data in all existing and proposed wells and compare to baseline conditions.
- 95. Assess operational plan effects on project uplands and wetlands. Modify to improve restoration benefits if warranted. Restoration is defined as pre-development condition of uplands and wetlands.

96. Assess the potential for exotic fish populations to move from canals to natural wetlands and affect wood stork forage fish populations post-restoration.
97. Monitor the yearly productivity of storks utilizing nesting colonies within 18.6 miles of the project site.
98. Conduct a baseline wading bird survey during the wet season (July 1 through January 30). Replicate this survey on a yearly basis during project construction, one year after restoration and at 5-year intervals for 20 years thereafter.

State-listed species

99. The information presented in this report represents an initial summary of potential impacts and benefits of CERP projects on state-listed species. As projects are further developed, their potential effects will become clearer, and more detailed recommendations will be provided by FWC.
100. Field surveys should be conducted for listed species, prior to site selection and construction. The list of potentially occurring species within this report is intended as a guide in determining which species to target in field surveys.
101. The Corps and District should follow FWC's Habitat Protection and Management Guidelines during detailed project design, construction, and maintenance (see next page for a list of specific guidelines).
102. CERP project managers should consult with the FWC and the Service for further details on listed-species concerns, and means by which to avoid impacts and enhance habitat value.
103. As a general rule, CERP project managers should avoid siting non-natural project features, such as stormwater treatment areas, impoundments, water treatment facilities, or ASR injection wells, on wetlands or relatively undisturbed uplands.
104. Projects located in close proximity to wading bird rookeries should minimize disturbance by conducting construction activities outside of the nesting season.
105. As most CERP projects involve creation of artificial impoundments, stormwater treatment areas, canals, or other non-natural features, the FWC encourages enhancement of fish and wildlife habitat on-site. Suggestions for habitat enhancement include establishment of native vegetation and creation of tree islands, wet prairies, littoral zones, or other natural habitats. The extensive acreage of non-natural features proposed in CERP (35,600 acres of STAs, 181,300 acres of surface water storage reservoirs, and more than 11,000 acres of in-ground reservoirs), indicates that habitat enhancements in constructed features would provide a spatially extensive range of benefits to native fish and wildlife.

106. The creation of non-natural features associated with many CERP projects presents a potential for further fragmentation of habitats for wide-ranging species, such as the black bear and the federally endangered Florida panther. CERP project managers should therefore work to create and maintain wildlife corridors for wide-ranging species.
107. Wherever possible, the FWC encourages the conservation and restoration of uplands and wetlands as an alternative or supplement to constructed project features. Natural areas, both upland and wetland, fulfill a multitude of essential functions, including: water quality improvement, aquifer recharge, water retention (in the case of wetlands), habitat for native flora and fauna, uptake of greenhouse gases, and improved air quality. Finally, natural areas have recreational and aesthetic value, and do not contribute to the increase in pollutant loading and habitat fragmentation associated with development or highway expansion.

Coordination with NOAA-Fisheries

Johnson's seagrass and sea turtles at sea

108. Coordinate project that may effect estuarine and marine resources like sea grasses and sea turtles with the NOAA-Fisheries. Construction of project elements may pose temporary negative impacts to water quality due to siltation during the movement of soil while building pump stations, dredging and constructing canals, placing STAs and constructing culverts. These impacts can be minimized with proper construction practices and siltation barriers to improve the water quality within downstream estuaries. This should improve growing conditions, and likely be a long-term positive effect for seagrasses.

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